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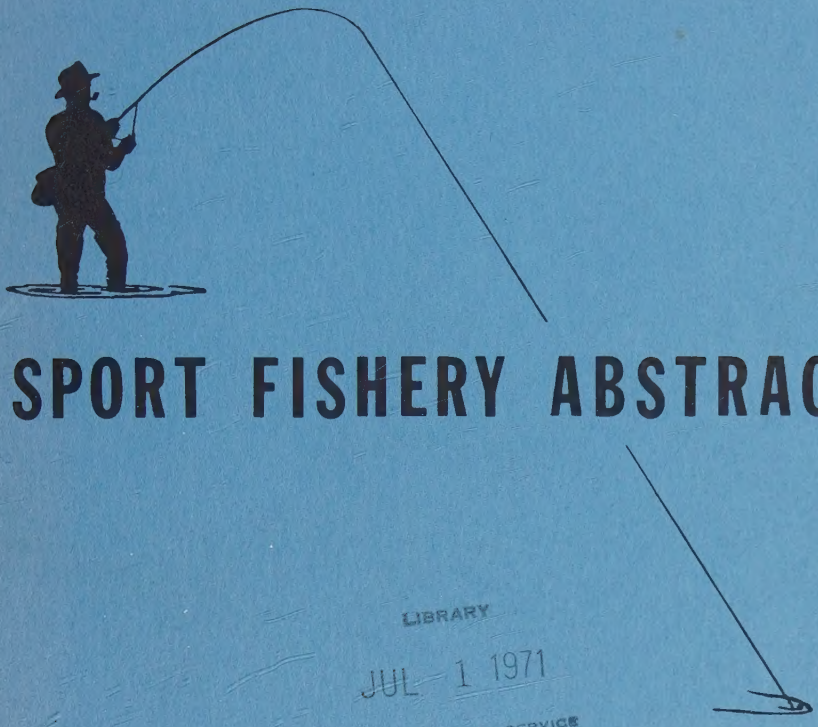

SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of published articles on limnology, ecology, natural history and other fields of specialization are included when the subject has application to the conservation and management of sport fishery resources.

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12785. French, Robert R., and W. Bruce McAlister (Bur. of Comm. Fish., Biol. Lab., Seattle, Washington). 1970. WINTER DISTRIBUTION OF SALMON IN RELATION TO CURRENTS AND WATER MASSES IN THE NORTHEASTERN PACIFIC OCEAN AND MIGRATIONS OF SOCKEYE SALMON. Trans. Amer. Fish. Soc., 99(4): 649-663.

Studies of the distribution of Pacific salmon (genus Oncorhynchus) indicated that various species and age groups have an affinity for certain environmental features as exemplified by water characteristics. In the winter of 1967 in the northeastern Pacific Ocean, immature age .1 and .2 sockeye salmon, chum salmon, and coho salmon were caught primarily in the Oyashio Extension and Subarctic Current Areas; maturing age .2 and .3 sockeye salmon were primarily in the Alaskan Stream and in the Alaskan Gyre (Ridge and Oyashio Extension Areas). The hypothesis is offered that maturing Bristol Bay sockeye salmon remain in the Alaskan Stream and Gyre in winter. The data suggested that some of the immature Bristol Bay sockeye salmon that will mature the following year recirculate in the Alaskan Gyre in the summer and do not make an extensive east-west migration, although other immature Bristol Bay sockeye salmon are known to migrate far to the west during the summer. (Authors)

12786. Beiningen, Kirk T., and Wesley J. Ebel (Bur. of Comm. Fish., Seattle, Washington). 1970. EFFECT OF JOHN DAY DAM ON DISSOLVED NITROGEN CONCENTRATIONS AND SALMON IN THE COLUMBIA RIVER, 1968. Trans. Amer. Fish. Soc., 99(4): 664-671.

Concentrations of dissolved nitrogen gas were measured in the lower 640 km of the Columbia River from April to September 1968 to determine the effect of newly-constructed John Day Dam on nitrogen saturation downstream. Observations were also made of symptoms of gas bubble disease and mortality in juvenile and adult salmon. Heavy spillway discharge at the dam caused abnormally high (123-143%) supersaturation downstream, and mortalities of juvenile and adult salmon (Oncorhynchus spp.) and steelhead trout (Salmo gairdneri) were substantial. Delays in passage at John Day and The Dalles Dams coupled with supersaturation of nitrogen gas caused the mortalities. The authors recommended that in future dam construction one or more turbines should be operable before the reservoir is filled. Increasing the flow through the turbines while decreasing flow over the spillways will reduce concentrations of nitrogen. In addition, every possible effort should be made to reduce the delay of salmon passing over dams. (Authors)

12787. Ebel, Wesley J. (Bur. of Comm. Fish., Biol. Lab., Seattle, Washington). 1970. EFFECT OF RELEASE LOCATION ON SURVIVAL OF JUVENILE FALL CHINOOK SALMON, Oncorhynchus tshawytscha. Trans. Amer. Fish. Soc., 99(4): 672-676.

In June 1968, juvenile chinook salmon from Little White Salmon National Fish Hatchery, Washington, were marked by freeze branding and released at six different locations in the Columbia River downstream from the hatchery. Marked fish were sampled in the estuary to compare survival of the different groups. Survival was more than doubled by transporting the fish to a point below Bonneville Dam (40 km downstream from Little White Salmon Hatchery) but was not appreciably increased by transporting them farther downstream. (Auth.)

12788. Ellis, Robert J. (Bur. of Comm. Fish., Biol. Lab., Auke Bay, Alaska). 1970. Alloperla STONEFLY NYMPHS: PREDATORS OR SCAVENGERS ON SALMON EGGS AND ALEVINS? Trans. Amer. Fish. Soc., 99(4): 677-683.

Stonefly nymphs have frequently been suspected of being predators or scavengers on salmonid eggs and alevins, and recent studies have particularly emphasized Alloperla nymphs. Live and dead salmon alevins were placed in perforated plastic boxes and buried in spawning riffles of two streams. Most dead alevins disappeared and more than 50% of the live alevins survived. Nymphs of Alloperla (A. oregonensis and A. borealis) were the most consistently abundant benthic animal in the plastic boxes. Dead eggs and alevins disappeared more rapidly from boxes placed in an area which contained few naturally occurring dead salmon eggs than in areas which

contained many. Dead eggs and alevins were eaten, and live eggs and alevins survived when placed in aquaria with Alloperla nymphs. I conclude that the Alloperla nymphs definitely were scavengers and probably not predators on pink salmon eggs and alevins. (Auth.)

12789. Marnell, Leo F., and Don Hunsaker II (Dept. of Fishery and Wildlife Biol., Colorado State Univ., Ft. Collins, Colorado). 1970. HOOKING MORTALITY OF LURE-CAUGHT CUTTHROAT TROUT (Salmo clarki) IN RELATION TO WATER TEMPERATURE, FATIGUE, AND REPRODUCTIVE MATURITY OF RELEASED FISH. Trans. Amer. Fish. Soc., 99(4): 684-688.

Experiments were conducted at Yellowstone Lake, Wyoming during the summers of 1967 and 1968 to assess the significance of water temperature, fatigue, and reproductive maturity of fish as factors contributing to hooking mortality of adult cutthroat trout (Salmo clarki) released after capture with treble-hook lures. Fish caught by casting from shore and from anchored boats were held for observation in floating liveboxes from 10 to 30 days. Control groups obtained by non-angling methods were confined simultaneously. Trout survival was not measurably affected by water temperatures in the range of 37 to 62 F. Tiring induced by anglers deliberately "playing" fish for up to 10 minutes did not increase mortality. There was no indication that reproductively mature trout were less resistant to the effects of hooking and handling than adult fish not in prespawning condition. Trout losses in all experiments were within the expected range of mortality attributable to treble-hook lures. (Authors)

12790. Macek, Kenneth J., Charles R. Rodgers, David L. Stalling, and Sidney Korn (U. S. Bur. of Sport Fisheries and Wildlife, Fish-Pesticide Res.-Lab., Columbia, Missouri). 1970. THE UPTAKE, DISTRIBUTION AND ELIMINATION OF DIETARY ^{14}C-DDT AND ^{14}C-DIELDRIN IN RAINBOW TROUT. Trans. Amer. Fish. Soc., 99(4): 689-695.

The rate and efficiency of uptake from food, the distribution in selected tissues, and the rate of elimination, of ^{14}C-p, p' DDT and ^{14}C-dieldrin in rainbow trout were investigated during and after a minimum of 140 days of exposure. Growth of fish during 140 days of exposure was not affected by insecticide exposure. However, both DDT and dieldrin significantly increased lipogenesis during this period. Total residue accumulation was dose-dependent, and those fish exposed to 0.2 mg/kg per week of either DDT or dieldrin, or to 1.0 mg/kg per week dieldrin apparently had reached the equilibrium state after 140 days of exposure. Fish accumulated 20-24% of the available dietary DDT and 9-11% of the available dietary dieldrin. Generally there was an approximately linear increase in the residue concentration of a tissue, followed by an equilibrium state during which the residue content remained virtually constant with continued exposure to the insecticide. The predicted time required for rainbow trout to eliminate 50% of total body DDT or dieldrin is 160 days or 40 days, respectively. Significant interaction between DDT and dieldrin was evident. In the pyloric caeca, the presence of dieldrin increased the rate of accumulation of DDT; conversely, the presence of DDT decreased the rate of accumulation of dieldrin. The presence of dieldrin decreases, if not inhibits, the elimination of DDT while the presence of DDT has no effect on the elimination of dieldrin. Interaction may effect total residue accumulation in rainbow trout. (Authors)

12791. McCarraher, D. B., and Richard W. Gregory (Nebraska Game and Parks Commission, Hastings College, Hastings, Nebraska). 1970. ADAPTABILITY AND CURRENT STATUS OF INTRODUCTIONS OF SACRAMENTO PERCH, Archoplites interruptus, IN NORTH AMERICA. Trans. Amer. Fish. Soc., 99(4): 700-707.

The Sacramento perch, Archoplites interruptus (Girard) is a relict centrarchid, historically found west of the Rocky Mountains. Since 1960, this species has been introduced into waters east of the Rocky Mountains. Sacramento perch are euryhaline and adaptable to inland mineral waters whose high salt content precludes the establishment of other game fishes. The species has survived and reproduced in chloride-sulfate waters with salinities near 17,000 ppm. Survival of Sacramento

perch has not been recorded in sodium-potassium carbonate waters exceeding 800 ppm in total alkalinity. Recent introductions have been made in Arizona, Colorado, Nebraska, New Mexico, South Dakota, and Texas. The annual growth rate of Sacramento perch is good in the larger alkaline and saline lakes where interspecific competition is limited to a few species. Natural propagation is not difficult and can be obtained in small rearing ponds. Aside from releases into mineral waters devoid of game fishes and hatchery pond propagation, fisheries agencies have shown little concern for the management of Sacramento perch in North America. (Authors)

12792. Lund, William A., Jr., and George C. Maltezos (Univ. of Conn., Marine Res. Lab., Noank, Connecticut). 1970. MOVEMENTS AND MIGRATIONS OF THE BLUEFISH, Pomatomus saltatrix, TAGGED IN WATERS OF NEW YORK AND SOUTHERN NEW ENGLAND. Trans. Amer. Fish. Soc., 99(4): 719-725.

Bluefish were tagged in and near Long Island Sound between 1964 and 1969. Tag returns support the belief that there is a discrete northern race of bluefish as more than 75% of the returns from fish at large more than one season return to the general area of Long Island Sound. Small bluefish move southward along the coast during late fall while adults, fish over approximately 45 cm total length, have an inshore-offshore migration. Bluefish first arrive in the area when the water temperatures reach 12 to 15C which is usually during May. The fish follow the warmer water by entering the inner bays of Long Island or going to the western end of Long Island Sound. Large numbers of bluefish arrive in the general area during late July and August after spawning in offshore waters. The fall migration takes place when the water temperature drops to approximately 13 to 15C. (Authors)

12793. Dragovich, Alexander (Bur. of Comm. Fish., U. S. Dept. of the Interior, Miami, Florida). 1970. THE FOOD OF BLUEFIN TUNA (Thunnus thynnus) IN THE WESTERN NORTH ATLANTIC OCEAN. Trans. Amer. Fish. Soc., 99(4): 726-731.

The stomach contents of 250 bluefin tuna, Thunnus thynnus, captured in the western North Atlantic from 1965 to 1966 by longline, purse seine, and trolling, were analyzed quantitatively and qualitatively. A large percentage (65%) of stomachs were empty. The food of bluefin tuna consisted of 22 taxa of fish, 10 of mollusks, and 8 of crustaceans. Salps were also present. By volume, fishes accounted for 76.9% of the stomach contents; mollusks, 18.1%; crustaceans, 4.2%; and unidentified invertebrates and salps, 0.7%. All food organisms were pelagic. The data do not show a clear relation between size of tuna and size of food. Differences were marked between composition of forage found in deep-swimming tunas caught by longline and that in tunas caught at the surface by purse seine or trolling. (Auth.)

12794. Bulkley, Ross V. (Iowa Coop. Fish. Unit, Iowa State Univ., Ames, Iowa). 1970. FEEDING INTERACTION BETWEEN ADULT BASS AND THEIR OFFSPRING. Trans. Amer. Fish. Soc., 99(4): 732-738.

Examination of young-of-the-year and adult yellow bass stomachs from Clear Lake, Iowa revealed that competition for food, if present during the 1967 growing season, was centered on utilization of Daphnia pulex. Heavy predation by parent bass on their offspring during late summer and autumn was attributed to smaller than average young bass in 1967, but predation by adults during this period might be a frequent factor affecting year-class strength. (Auth.)

12795. Brungs, William A., and Donald I. Mount (Newtown Fish Toxicology Lab., Cincinnati, Ohio). 1970. A WATER DELIVERY SYSTEM FOR SMALL FISH-HOLDING TANKS. Trans. Amer. Fish. Soc., 99(4): 799-802.

12796. Zaugg, W. S. (Western Fish Nutr. Lab., Bur. of Sport Fish. & Wildlife, Cook, Washington). 1970. COMMENTS ON THE RELATIONSHIP BETWEEN GILL ATPase ACTIVITIES, MIGRATION, AND SALT WATER ADAPTION OF COHO SALMON. Trans. Amer. Fish. Soc., 99(4): 811-813.

12797. Johnson, James E. (Dept. of Zoology, Arizona State Univ., Tempe, Arizona). 1970. AGE, GROWTH, AND POPULATION DYNAMICS OF THREADFIN SHAD, Dorosoma petenense (Gunther) IN CENTRAL ARIZONA RESERVOIRS. Trans. Amer. Fish. Soc., 99(4): 739-753.

Threadfin shad in the Salt River reservoirs of central Arizona were aged by length-frequencies and scale annuli. The growing season in established populations was from April through August, surprisingly short for the desert southwest. A re-establishing population in Saguaro Lake, however, continued to grow throughout the winter of 1967. In order to determine the growth-limiting variables, comparisons were made between the established populations and the re-establishing one. Extrinsic factors appeared similar in all of the reservoirs in 1967. The most probable limiting factors were related to plankton abundance and population density of the shad, with growth declining as densities increased when young-of-the-year fish gained the adults' limnetic behavior. Year-class strength had variable effects on the rate of growth, and is in need of further study. The first year's growth was remarkably stable regardless of year-class strength, however, with minor fluctuations showing some correlation with spring water temperatures. Both sexes demonstrated similar growth rates, with larger female shad resulting from differential mortality rather than growth. (Auth.)

12798. Smith, Stanford, H. (U. S. Bur. of Comm. Fish., Great Lakes Fishery Lab., Ann Arbor, Michigan). 1970. SPECIES INTERACTIONS OF THE ALEWIFE IN THE GREAT LAKES. Trans. Amer. Fish. Soc., 99(4): 754-765.

The alewife (Alosa pseudoharengus) has caused serious problems in the Great Lakes for almost 100 years. It entered Lake Ontario in abundance via the Erie Canal during the 1860's when major piscivores were declining, and became the dominant species in the lake during the 1870's. The alewife subsequently spread throughout the Great Lakes and became the dominant species in Lakes Huron and Michigan as major piscivores declined. In lakes where it became extremely abundant, the shallow-water planktivores declined in the first decade after alewife establishment, the minor piscivores increased then declined in the second decade, and the deepwater planktivores declined in the third decade. The consequence has been a general reduction in fishery productivity. Rehabilitation will require extreme reduction of the alewife, and restoration of an interacting complex of deep- and shallow-water forage species, and minor and major piscivores, either by reestablishing species affected by the alewife, or by the introduction of new species that can thrive under the new ecological conditions of the lakes. (Auth.)

12799. Lawrie, A. H. (Fish. Res. Bd. of Canada, Freshwater Inst., Winnipeg, Manitoba, Canada). 1970. THE SEA LAMPREY IN THE GREAT LAKES. Trans. Amer. Fish. Soc., 99(4): 766-775.

The sea lamprey was inadvertently introduced above Niagara Falls by the development of the Welland Canal between Lakes Ontario and Erie. A major population did not develop in Lake Erie but the species rapidly established itself as a highly significant predator in all three upper lakes. Its most obvious effect was the virtual extermination of the lake trout which had been the mainstay of the fishery. Efforts were made to limit sea lamprey reproduction by blocking the major spawning runs. These measures helped define the scope of the problem and generated considerable knowledge of the fluvial phase of the animal's life history but apparently exerted no significant restraint on population growth. Later control measures employed lamprey specific, selective toxicants to destroy larval populations in stream and estuarine habitats. Introduced first on Lake Superior to conserve the only significant lake trout stock then remaining, vigorous prosecution of these "treatments" resulted in a reduction, in 1961-62, of the Lake Superior adult sea lamprey population to a fifth or less of its maximum level. Since then the decline has continued though much less precipitously. A marked decrease in the proportion of males to females has accompanied the reduction in numbers. Similar changes in the sex ratio of spawning run Lake Michigan sea lamprey presumably reflect successful extension of control measures to that lake. Treatment of lamprey infected Lake Huron tributaries is not yet complete. Further

reductions in lamprey numbers can reasonably be expected to result from improving treatment techniques but it is clear that total extermination is an unrealistic goal. It is not yet clear whether the present degree of control will permit restoration of self sustaining stocks of lake trout and other depleted prey populations. (Auth.)

12800. Berra, Tim M., and Gerald E. Gunning (Dept. of Biology, Tulane, Univ., New Orleans, Louisiana). 1970. REPOPULATION OF EXPERIMENTALLY DECIMATED SECTIONS OF STREAMS BY LONGEAR SUNFISH, Lepomis megalotis megalotis (Rafinesque). Trans. Amer. Fish. Soc., 99(4): 776-781.

Repopulation by longear sunfish of stream segments decimated by electrofishing was studied in six areas on four streams in Louisiana. Lepomis m. megalotis (Rafinesque) repopulated the decimated areas to a level as great or greater (3.5 times) than the biomass of the decimation sample at four of the six areas within one year. Repopulation occurred between March and late summer and was accomplished by fish at least two years old. A principal factor allowing rapid repopulation of longear sunfish in the decimated segments may have been an apparent lack of repopulation by large predatory species.

12801. Moring, John R. (Dept. of Fish., Humboldt State College, Arcata, California). 1970. USE OF THE ANESTHETIC QUINALDINE FOR HANDLING PACIFIC COAST INTERTIDAL FISHES. Trans. Amer. Fish. Soc., 99(4): 802-805.

An advantage of quinaldine is that fish can be left for extended periods in the solution, without ill effects, provided concentrations do not exceed desirable levels. Fish were collected in water temperatures of 8.3 to 17.2 C, with an average water temperature of 12.2C. Anesthetizing times varied from 30 seconds or less (Scorpaenichthys marmoratus, rockfish) to two to four minutes (other cottids). Recovery times ranged from approximately 5 minutes (cottids, pholids, stichaeids) to 9 to 14 minutes (Citharichthys stigmaeus, rockfish). (From auth. discussion)

12802. Parker, Richard O., Jr. (Ohio State Univ., Columbus, Ohio). 1970. SURFACING OF DEAD FISH FOLLOWING APPLICATION OF ROTENONE. Trans. Amer. Fish. Soc., 99(4): 805-807.

This study examined the rate and extent of surfacing of rotenone killed fish in the laboratory and in the field, with special attention given to the influence of environmental factors on surfacing.

12803. Brown, Bradford E. (Oklahoma Coop. Fish. Unit, Oklahoma State Univ., Stillwater, Oklahoma). 1970. EXPONENTIAL DECREASE IN A POPULATION OF FATHEAD MINNOWS. Trans. Amer. Fish. Soc., 99(4): 807-809.

The factors operating on a fathead minnow population during the first summer after stocking were reproduction and natural mortality. In order for constant exponential rate of decrease to occur, either the rates of reproduction and mortality would have to be constant or vary reciprocally so that the total rate remained unchanged. Predation by largemouth bass appeared to be the most logical major source of natural mortality. (From auth. discussion)

12804. Boyd, Claude E. (Savannah River Ecol. Lab., Aiken, South Carolina). 1970. NUTRIENT CONTENT OF OFFAL AND SMALL FISH FROM SOME FRESHWATER FISH CULTURES. Trans. Amer. Fish. Soc., 99(4): 809-811.

Information on the quantity of offal and its nutrient composition is presented for channel catfish (Ictalurus punctatus), white catfish (I. catus), common carp (Cyprinus carpio), and Java tilapia (Tilapia mossambica).

12805. Herman, Roger Lee (Bur. of Sport Fisheries and Wildlife, Eastern Fish Disease Lab., Leetown, West Virginia). 1970. EFFECTS OF GOSSYPOL ON RAINBOW TROUT Salmo gairdneri Richardson. J. Fish Biol., 2(4): 293-303.

Rainbow trout were fed gossypol acetate or cottonseed meals containing gossypol for 14 months. Toxic effects were indicated by growth depression, reduced hematocrit, hemoglobin, and total plasma protein. Histological changes were noted, particularly in the liver and kidney. (Auth.)

12806. Sanders, J. E., J. L. Fryer, and R. W. Gould (Dept. of Microbiology, Oregon State Univ., Corvallis, Oregon). 1970. OCCURRENCE OF THE MYXOSPORIDAN PARASITE Ceratomyxa shasta, IN SALMONID FISH FROM THE COLUMBIA RIVER BASIN AND OREGON COASTAL STREAMS. In: A Symposium on Diseases of Fishes and Shellfishes, Spec. Publication No. 5, Amer. Fish. Soc., pp. 133-141.

The occurrence and distribution of the myxosporidan, Ceratomyxa shasta, were investigated in the Columbia River basin and Oregon coastal streams. Infected adult salmonids were found widely distributed in the Columbia River system; however, the infectious stage of this disease appears to be restricted to the Deschutes River system and the Columbia River below its confluence with the Deschutes River. The Cowlitz River in Washington was also established as a source of the disease. Information concerning the incidence of infection in both juvenile and adult salmonids is included. (Authors)

12807. Hodkinson, Madeline, and Alan Hunter (Dept. of Biol., University of Salford, Salford, England). 1970. IMMUNE RESPONSE OF U. D. N. -INFECTED SALMON TO Saprolegnia. J. Fish Biol., 2(4): 305-311.

Sera from salmon Salmo salar L. suspected of U. D. N. -infection were tested (by double gel diffusion) against antigens prepared from diseased salmon tissues and Saprolegnia. Precipitating antibodies to the fungus were found in 93% of the salmon, but only 66% of these fish were colonized by fungus. The antibodies were detected in parr and adult salmon. (Authors)

12808. Shehadeh, Ziad H., and James N. Ellis (The Oceanic Institute, Waimanalo, Hawaii). 1970. INDUCED SPAWNING OF THE STRIPED MULLET Mugil cephalus L. J. Fish Biol., 2(4): 355-360.

The response of adult mullet to artificial hypophysation before the onset of the spawning migration was studied. Both males and females received intraperitoneal injections of mullet or salmon pituitary homogenates with ACTH or Synahorin (APE + HCG) three times per week for 12 days. At the outset, control females were in the tertiary yolk stage with a low mean GSI of 7.6, while males gave thick, non-dispersing milt. Two of four females receiving one salmon pituitary plus 25 RU Synahorin per injection spawned spontaneously in laboratory aquaria. Released eggs were buoyant, well formed and had a mean diameter of 570 μm. Egg fertility could not be ascertained due to protracted contact with sea water. Spawned females extruded a membranous tissue "plug" from the cloacal region which was subsequently retracted. The remaining experimental females were refractory to treatment and histological examination of the ovaries revealed a predominance of atretic oocytes. All males were refractory to treatment and milt hydration was not achieved. It is suggested that induction of early spawning is possible especially with higher doses of pituitary homogenates and Synahorin. (Authors)

12809. Walkey, M., and R. H. Meakins (Dept. of Zoology and Comp. Physiol., Queen Mary College, Univ. of London, London, England). 1970. AN ATTEMPT TO BALANCE THE ENERGY BUDGET OF A HOST-PARASITE SYSTEM. J. Fish Biol., 2(4): 361-372.

A quantitative assessment of the demand by the parasite Schistocephalus solidus (Müller, 1776) upon its secondary host, Gasterosteus aculeatus L., was obtained by comparing the energy budgets for infected and non-infected fish. Observations on the energy transformations during feeding, assimilation, growth and respiration of fishes indicated some overall effects of the parasite upon host metabolism. Infections resulted in a greater depletion of host food reserves, shown by a marked increase in mortality of parasitized fish during starvation. When fed ad libitum upon Tubifex, differences were recorded in the feeding and assimilation rates of fish. By comparison, no significant differences were detected in the respiratory expenditure of infected and non-infected hosts. The computation of energy budgets indicated that fish bearing parasites characteristically exhibited a higher gross efficiency than did fish without parasites. However,

subtraction of the calculated effect due to the presence of worms, suggested that the efficiency of infected fish alone, that is, without their parasites, was actually lower than the efficiency of uninfected fish. It is considered therefore that the apparent greater energy turnover in a parasitized fish is due to the parasite being more efficient in its energy transformations than is its host. (Authors)

12810. Roberts, Ronald J., W. M. Shearer, A. L. S. Munro, and K. G. R. Elson (Dept. of Veterin. Pathol., Univ. of Glasgow, Scotland). 1970. STUDIES ON ULCERATIVE DERMAL NECROSIS OF SALMONIDS II. THE SEQUENTIAL PATHOLOGY OF THE LESIONS. J. Fish Biol., 2(4): 373-378.

The gross pathology and histopathology of a series of 150 cases of UDN disease of salmon Salmo salar L. from a number of Scottish rivers is described. The lesions appeared first as small grey areas on the heads of affected fish, which gradually enlarged in size, ulcerated and became infected with fungus of the Saprolegnia group. Histologically, the earliest lesion was an acantholysis of the suprabasal cells of the epidermis developing into transient bullae which rapidly sloughed to produce a ragged irregular epidermis. Once the basement membrane was breached secondary infection by fungi rapidly ensued. The histopathology, in the early stages, was consistent with possible viral infection, or anoxic atrophy but it was considered that the most similar lesion from mammalian experience, was that of the Pemphigus group of dermatoses. (Authors)

12811. Vinberg, G. G. 1970. STREAM OF ENERGY IN THE ECOSYSTEM OF AN EUTROPHIC LAKE. (Potok energii v ekosisteme evtrofnogo ozera). Doklady Academy of Sciences of USSR, 186(1): 198-201, in Russian; Univ. of Wisconsin Eutrophication Abstracts No. 19, p. 13.

This ecosystematic survey of the 3000-hectare eutrophic lake included determinations of primary production, phytoplankton, zooplankton, zoobenthos, and population as well as fish nutrition. Each component of the ecosystem was appraised in terms of its biomass (B), production (P), catabolism (T), loss of energy in exchange and assimilation of food (A = T + P), consumption of food (R), and the corresponding ratios P/B, T/B, and P/A. For a population having a constant biomass, the coefficient P/B expresses the "turnover rate," whereas the value B/P -- the "turnover time." Both oxygen consumption method and solution of the equation rendered similar T values. The fish consumed during the summer 2.65% of the total supply of energy; the annual harvest of fish constituted only 0.14% of the total primary production.

12812. Fredeen, F. J. H., and J. Regis Duffy (Dept. of Agric., Saskatoon, Saskatchewan). 1970. INSECTICIDE RESIDUES IN SOME COMPONENTS OF THE ST. LAWRENCE RIVER ECOSYSTEM FOLLOWING APPLICATION OF DDD. Pesticides Monitoring Journal, 3(4): 219-226; Selected Water Resources Abstracts, 3(19): p. 34.

DDD (TDE) residues were measured in water, mud, mollusks, and fish of the St. Lawrence River in 1967 during and after application of DDD to control nuisance insects. Concentrations detected in water (up to 0.0139 ppm) ranged from 1 to 17% of those applied to the river 10 miles upstream. DDD concentrations in mollusks 17 miles upstream from the point of application and 10 and 45 miles downstream, averaged 0.002, 0.101, and 0.0 ppm, respectively. In the same samples, concentrations of DDT and DDE combined (from unknown sources) averaged 0.030, 0.225, and 0.027 ppm. In edible flesh from 216 fish of 5 species, DDD residues averaged 0.156 ppm in samples collected 17 miles upstream and 0.369 in the combined samples from points 10 and 45 miles downstream. Residues of DDT plus DDE in these same samples averaged 0.224 and 0.227 ppm, respectively. The highest concentration of DDD in an individual fish was 1.81 ppm. The ultimate fate of the DDD, that is its conversion to materials with reduced toxicities, is poorly understood. DDD is itself a product of the reductive dechlorination of DDT in nature. -- Jones.

12813. Westman, Kai, Olli Sumari, and Jorma J. Laine. 1969. COMPARATIVE DRY DIET FEEDING EXPERIMENT ON RAINBOW TROUT (Salmo gairdneri Richardson) IN FLOATING NET-CONTAINERS. Suom. Kalatal. Finlands Fiskerier No. 40, 46 p.

In the present study six Finnish and three foreign commercial dry diets for rainbow trout were studied and compared in a feeding experiment in floating nets. Comparisons were made in regard to growth, mortality, condition factor, flesh colour, conversion of food into fish and food costs to produce one kilo of fish. Furthermore, the raw materials of the diets were ascertained, and their chemical composition analysed and compared with that of the propagated trout and their livers. (From authors summ.)

12814. Sumari, Olli, and Kai Westman. 1969. THE MANAGEMENT OF NORTHERN PIKE (Esox lucius L.) POPULATIONS. Suom. Kalatal. Finlands Fiskerier No. 43, 24 p. (In Finnish, English summary).

The purpose of this paper is to examine, in the light of the published data, the effect of stocking newly hatched pike fry and to consider what other means are available for managing pike populations. (From authors summ.)

12815. Wells, Ralph A., and William J. McNeil (U. S. Army Hospital, Fairbanks, Alaska). 1970. EFFECT OF QUALITY OF THE SPAWNING BED ON GROWTH AND DEVELOPMENT OF PINK SALMON EMBRYOS AND ALEVINS. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 616, 6 p.

Among three segments of the spawning ground in Sashin Creek, southeastern Alaska, the largest and fastest developing embryos and alevins of pink salmon, Oncorhynchus gorbuscha, came from spawning gravels characterized by high levels of dissolved oxygen in intragravel water. The high oxygen levels occurred in a stream segment which has a relatively steep grade and coarse materials in the bed. No differences in water temperature were observed among the three segments. (Authors)

12816. Hoyt, Robert D. (Biology Dept., Univ. of Louisville, Louisville, Kentucky). 1970. FOOD HABITS OF THE SILVERJAW MINNOW, Ericymba buccata Cope, IN AN INTERMITTENT STREAM IN KENTUCKY. Amer. Midl. Nat., 84(1): 226-236.

The feeding activity of the silverjaw minnow, Ericymba buccata Cope, is closely associated with that of the bluntnose minnow, Pimephales notatus (Rafinesque), and the stoneroller minnow, Campostoma anomalum (Rafinesque). Digestive tracts of 249 silverjaw minnows, taken from two stations on Plum Creek, Spencer and Bullitt counties, Kentucky, were examined and the contents identified. These data were analyzed according to the size of the fish, time of the year, and the availability of food. The food category occurring most often in digestive tracts of fish of all sizes was the order Diptera, chiefly chironomids, followed by detritus, Ephemeroptera, and Cladocera. Minnows 33 to 45 mm total length consumed more cladocerans and fewer mayflies while the reverse was observed in specimens 46 to 76 mm. A greater variety of organisms was eaten by all fish in the winter and spring. (Auth.)

12817. Lom, Jiří (Institute of Parasitol., Czechoslovak Academy of Sciences, Prague, Czechoslovakia). 1970. OBSERVATIONS ON TRICHODINID CILIATES FROM FRESHWATER FISHES. Archiv für Protistenkunde, 112(3): 153-177.

In our studies on protozoan parasites of freshwater fishes we have paid special attention to urceolariid ciliates. The taxonomy of this group is still imperfect and yet, a reliable separation of the individual species is one of the conditions required for an accurate ecological analysis of the protozoan parasitofauna of fishes. Also, the host spectrum of the individual ciliate species and their variability should be studied in more detail, because trichodinids are a suitable subject for studying the host-parasite relationship as reflected in changes of the ciliates' morphology of which knowledge is still scarce. Our material has been collected mostly in Czechoslovakia; some of it has been obtained during occasional trips abroad, and, finally, some has been given to us by the courtesy of our colleagues. (Auth. introduction)

12818. Weatherley, A. H. (Zoology Dept., Australian Nat. Univ., Canberra, A. C. T. Australia). 1970. EFFECTS OF SUPERABUNDANT OXYGEN ON THERMAL TOLERANCE OF GOLDFISH. Biol. Bull., Woods Hole, 139(1): 229-238.

A hypothesis may be made out that the respiratory/circulatory, and possibly the oxygen transport, systems are importantly involved in thermal death of goldfish. Experiments showed that at two distinct levels of temperature acclimation, superabundant oxygen in the water could produce a definite improvement either in time of survival at a fixed lethal temperature or in lethal temperature reached as a result of heating. Despite this positive effect of high oxygen a clear cut failure of oxygen, in excess of about 5 atmospheres (partial pressure), to produce further improvement in thermal tolerance suggests the failure of some critical system directly affected by temperature. The experiments, while revealing nothing of the detailed mechanisms involved, certainly do not invalidate the hypothesis proposed, and open a way to further investigation. (Auth. summ.)

12819. Hill, B. J., and I. C. Potter (Dept. of Zoology, Duke Univ., Durham, North Carolina). 1970. OXYGEN CONSUMPTION IN AMMOCOETES OF THE LAMPREY Ichthyomyzon hubbsi Raney. J. exp. Biol., 53(1): 47-57.

A continuous flow respirometer suitable for measuring oxygen consumption in some small burrowing aquatic animals is described. Rates of oxygen consumption in ammocoetes of the lamprey Ichthyomyzon hubbsi are low, with mean values at 15.5°C ranging from 38.8 to 97.1 µl/g/h for large (3.44 g) and small (0.14 g) animals respectively. A Q_{10} of 3.6 was found for medium-size animals (1.18 g) between 3.5 and 22.5°C. The slope of the logarithmic linear regression relating weight and oxygen consumption was 0.718 at 15.5°C. The rates of oxygen consumption are discussed with respect to the ecology of ammocoetes and compared with those obtained for other lower vertebrates. (Authors summ.)

12820. Potter, I. C., B. J. Hill, and Susan Gentleman (Dept. of Zoology, Duke Univ., Durham, North Carolina). 1970. SURVIVAL AND BEHAVIOUR OF AMMOCOETES AT LOW OXYGEN TENSIONS. J. exp. Biol., 53(1): 59-73.

Survival and behaviour studies were made on ammocoetes subjected to water of various tensions of oxygen and carbon dioxide. Ammocoetes can tolerate, for at least 4 days, oxygen tensions as low as 7-10 mmHg at 5°C, 12-16 mmHg at 15.5°C and between 13-16 and 19-21 mmHg at 22.5°C. A limited ability to acclimate to low oxygen tensions was found in some animals. A characteristic emergence behaviour is evoked by low partial pressures of oxygen that approach the lethal level and by high concentrations of carbon dioxide. Ammocoetes respond to low oxygen and high carbon dioxide by an increase in the rate and amplitude of beating of the branchial basket. This increase is maintained in animals able to survive at low oxygen tensions. A high affinity of the blood for oxygen is evident from oxygen equilibrium curves determined on erythrocytes suspension. There was an insignificant Bohr effect at 15.5°C in the pH range 7.68-6.70, although a change occurred in the n value. Haemoglobin concentration, haematocrit and oxygen equilibria suggest that the characteristics of the blood contribute significantly to the ability of ammocoetes to survive in low oxygen conditions. (Authors summ.)

12821. Dandy, J. W. T. (Dept. of Zoology, Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1970. ACTIVITY RESPONSE TO OXYGEN IN THE BROOK TROUT, Salvelinus fontinalis (Mitchill). Canad. J. Zool., 48(5): 1067-1072.

Locomotory activity of brook trout was measured at 10°C in water of three different oxygen concentrations. Activity was sensed with a thermistor probe in a Wheatstone bridge circuit. Voltage output of the bridge was integrated automatically and recorded. Exposure to 6.0 and 1.7 p.p.m. oxygen induced an activity response within minutes which reached a peak during the first hour then slowly waned. The intensity of response was greater to lower than to higher oxygen levels. Not all fish responded to 8.0 p.p.m. The response threshold concentration was estimated to be 8.3 p.p.m. oxygen. The response appeared to be made to the absolute concentration rather than to the rate of oxygen decrease. Various

difficulties in estimating thresholds for dissolved substances in a constant flow system are considered. It is suggested that the response threshold found here be applied only in the specific circumstances of this experiment. (Auth.)

12822. Saunders, Lloyd, and G. Power (Dept. of Biology, Univ. of New Brunswick, Fredericton, New Brunswick). 1970. SEX RATIO AND FECUNDITY OF AMERICAN SMELT Osmerus mordax (Mitchill), FROM MATAMEK LAKE, QUEBEC. Canad. J. Zool., 48(4): 898-900.

The sex ratio, male:female, of 145 smelt collected on 28-29 May, 1969, from Matamek Lake, Quebec, was 71:74. Females from age groups III-VI produced an average of 44,964 ova per fish. Fecundity was higher in this population than in populations from the Great Lakes. (Authors)

12823. Utter, Fred M., and Harold O. Hodgins (Bur. of Comm. Fisheries, Biol. Laboratory, Seattle, Washington). 1970. PHOSPHOGLUCOMUTASE POLYMORPHISM IN SOCKEYE SALMON. Comp. Biochem. Physiol., 36(1): 195-199.

Phosphoglucomutase phenotypes of all but one of 633 sockeye salmon (Oncorhynchus nerka) consisted of one or both of two zones of activity resolved by starch gel electrophoresis. The common phenotypes could be explained by a hypothesis of two alleles at a single locus; the exceptional phenotype could be explained by postulating a third allele. Variations in frequency of these phenotypes in samples from three major geographic areas suggest that this system may be useful for population studies. (Authors)

12824. Tedla, Shibru, and C. H. Fernando (Dept. of Biology, Univ. of Waterloo, Waterloo, Ontario, Canada). 1970. ON THE BIOLOGY OF Ergasilus confusus Bere, 1931 (COPEPODA), INFESTING YELLOW PERCH, Perca fluviatilis L., IN THE BAY OF QUINTE, LAKE ONTARIO, CANADA. Crustaceana, 19(1): 1-14. Translation of summary only from the German by Robert M. Howland.

The copepod Ergasilus confusus Bere lives on the perch Perca fluviatilis L. Seasonal changes in the occurrence of E. confusus and the rate of infestation were recorded for one year. The occurrence is greater in summer, the rate of infestation higher in winter. The lower occurrence in winter seems to be attributable to error in the collection technique during this time of year. The occurrence and infestation rate are very low in autumn, since overwintering copepod females are not yet infective. The infestation by overwintering copepods lasts until December. The first egg-bearing copepod females were found on May 10, individuals with hatching nauplii on May 23. E. confusus often has two summer generations. Infestation by the first summer generation occurs during the second half of June; infestation by the second summer generation during August. The egg production is halted in October. Occurrence and infestation rate are evidently positively correlated with the body size of the fish examined. The copepods were not distributed uniformly over the different gill arches; most favored the second and third gill arches. The overwintering females are substantially larger and produce more eggs per brood than those of the summer generations. The first summer generation produces more eggs per brood than the second. The carapace length of egg-bearing females and their egg numbers appear to be correlated positively with one another. (Authors summ.)

12825. Baranova, V. P., and M. P. Miroshnichenko (Volgograd Branch of the State Res. Inst. for Lake and River Fish Breeding). 1969. CONDITIONS AND PROSPECTS FOR CULTURING STURGEON FRY IN THE VOLGOGRAD STURGEON NURSERY. Hydrobiological Journal (American Fish. Soc., Translated and produced by Scripta Technica, Inc.), 5(1): 63-67.

It appears that is is quite possible to artificially breed the sturgeon, because mature adults accumulate in great numbers in the Volga in the region of the hatchery and fry can be cultured in ponds with rich forage reserves. Thus, it is essential to resume studies in the Volgograd sturgeon nursery on the cultivation of this major stock of commercial sturgeon of the Caspian.

12826. Menshutkin, V. V., and T. I. Prikhodko (Inst. of Evol. Physiol. and Biochem., Acad. of Sci. of the USSR, Leningrad, USSR). 1969. PRODUCTIVE PROPERTIES OF STABLE POPULATIONS WITH A PROLONGED PERIOD OF REPRODUCTION. Hydrobiological Journal (Amer. Fish. Soc., Translated and produced by Scripta Technica, Inc.), 5(1): 1-7.

The population of zooplanktonic organisms is treated as a self-controlling system, the model of which is analyzed on an electronic computer. A dimensionless coefficient P/B which is the ratio of production of a given generation to its average biomass is introduced. The suggested interpretation of P/B is convenient for comparing the productive properties of different populations of species with sharply differing life cycles and developmental rates. The investigation of a zooplankton population model permitted to find a stable region when food supply and loss to predation vary. It is shown that a large change of external trophic conditions causes a small variation of the P/B coefficient.

12827. Mulcahy, Maire F., and Ann O'Leary (Dept. of Zoology, University College, Cork, Ireland). 1970. CELL-FREE TRANSMISSION OF LYMPHOSARCOMA IN THE NORTHERN PIKE Esox lucius L. (PISCES; ESOCIDAE). Experientia, 26(8): p. 891. Translation of summary only from the German by Robert M. Howland.

In the pike Esox lucius L. a lymphosarcoma could be transmitted using cell-free filtrate and therewith the virus etiology demonstrated. (Authors summ.)

12828. Patrick, Ruth (The Academy of Natural Sciences, Philadelphia, Pennsylvania). 1970. BENTHIC STREAM COMMUNITIES. American Scientist, 58(5): 546-549.

A discussion of the factors that affect the structure and function of benthic stream communities.

12829. Williscroft, S. N., and H. Tsuyuki (Fish. Res. Bd. Canada, Vancouver Lab., Vancouver 8, British Columbia). 1970. LACTATE DEHYDROGENASE SYSTEMS OF RAINBOW TROUT – EVIDENCE FOR POLYMORPHISM IN LIVER AND ADDITIONAL SUBUNITS IN GILLS. J. Fish. Res. Bd. Canada, 27(9): 1563-1567.

Three lactate dehydrogenase phenotypes, CC, CC', and C'C', were encountered in the livers of rainbow trout (Salmo gairdneri) resident in Kokanee Creek, which flows into the west arm of Kootenay Lake, B. C. The rare subunit C occurred in high frequency in specimens from this area. Two additional lactate dehydrogenase subunits, designated E^1 and E^2 in this study, and not reported previously, were found in the gill tissues of common stocks of rainbow trout homozygous for the C'C' phenotype, raising the total number of molecular species, based on 10 electrophoretically distinct subunits, to at least 23 for this species. (Authors)

12830. Møller, Dag (Fish. Res. Bd. Canada, Biol. Sta., St. Andrews, New Brunswick). 1970. TRANSFERRIN POLYMORPHISM IN ATLANTIC SALMON (Salmo salar). J. Fish. Res. Bd. Canada, 27(9): 1617-1625.

Three main patterns of transferrins, made up of two molecular types, were found by starch-agar electrophoresis in plasma of hatchery and wild Atlantic salmon (Salmo salar). Distributions of the observed patterns from progenies of three hatchery matings agreed with expected Mendelian distributions in offspring of known parentage, implying that the bands have their origin in two codominant alleles. In nearly all samples of the wild salmon the genetic basis of transferrin variation was demonstrated by nonsignificant differences between observed and expected distributions when the Hardy-Weinberg formula was applied. Frequencies of the Tf^A allele differed in samples from different rivers and within the same river; the Atlantic salmon forms genetically different populations. Interchange of stocks probably influenced the values of the different gene frequencies found. (Auth.)

12831. Davis, John C., and Kenneth Watters (Dept. of Zoology, Univ. of British Columbia, Vancouver 8, British Columbia). 1970. EVALUATION OF OPERCULAR CATHETERIZATION AS A METHOD FOR SAMPLING WATER EXPIRED BY FISH. J. Fish. Res. Bd. Canada, 27(9): 1627-1635.

Experiments were carried out on rainbow trout to see if cannulae implanted at different positions on the operculum yield accurate estimates of mean expired oxygen tension. This value is frequently used to calculate utilization or ventilation volume in fish and should therefore be accurately determined. Opercular oxygen tension (Pe_{O_2}) recorded from seven quiescent fish (383-426 g, 10-12 C) in aquaria was highly variable with respect to time and cannula placement. Expired P_{O_2} recorded from cannulae placed in the middle, upper, or lower part of the posterior margin of the operculum ranged from 54 to 157 mm Hg and was sometimes identical with inspired P_{O_2}. When the fish were chased, expired oxygen tension usually rose but the magnitude of the rise and its duration were not uniform from cannula placement to placement. Other studies, on 21 trout (217-388 g, 10-12.5 C) whose gills were perfused with water at different flow rates with a mouth tube, indicated that the Pe_{O_2} variability existed over a wide range of perfusion rates. In addition, Pe_{O_2} levels from all three placements at perfusion rates approximating those of normal ventilation were frequently below the mean expired oxygen tension calculated from oxygen uptake and gill waterflow rate data. It is concluded that opercular cannulae provide poor estimates of mean expired oxygen tension in trout. The use of this technique to determine mean Pe_{O_2} could lead to serious errors. It appears that large changes in oxygen utilization can be detected with opercular cannulae but any utilization values determined in this way would likely be erroneous. (Authors)

12832. Brown, Clinton E., and Barry S. Muir (Hydronautics, Inc., Laurel, Maryland). 1970. ANALYSIS OF RAM VENTILATION OF FISH GILLS WITH APPLICATION TO SKIPJACK TUNA (Katsuwonus pelamis). J. Fish. Res. Bd. Canada, 27(9): 1637-1652.

Some species of fish use "ram ventilation" to pass water over the gills while swimming. Hydrodynamic analysis provides estimates of the pressure losses as the water passes through the gill spaces, and of the resistance force that must be overcome by the swimming muscles. For a 44-cm skipjack tuna (Katsuwonus pelamis), swimming at its basal speed of 66 cm/sec, the gill resistance is estimated to be 1090 dynes or 7% of the total swimming resistance. If oxygen consumption doubles, gill resistance increases to 27% of the total. The energetic cost of respiration lies between 1 and 3% of the total metabolism at basal swimming speed. (Authors)

12833. Lackey, R. T. (Dept. of Fish. and Wildl. Biol., Colorado State Univ., Fort Collins, Colorado). 1970. SEASONAL DEPTH DISTRIBUTIONS OF LANDLOCKED ATLANTIC SALMON, BROOK TROUT, LANDLOCKED ALEWIVES, AND AMERICAN SMELT IN A SMALL LAKE. J. Fish. Res. Bd. Canada, 27(9): 1656-1661.

Seasonal depth distributions of landlocked Atlantic salmon (Salmo salar), brook trout (Salvelinus fontinalis), landlocked alewives (Alosa pseudoharengus), and American smelt (Osmerus mordax) were determined monthly in Echo Lake, Maine, using vertical and horizontal gillnets. Salmon were wide-ranging fish, but generally not captured in very shallow or very deep water. Brook trout were primarily an inshore species, not often captured in water deeper than 25 ft, and nearly always found close to the lake bottom. The majority of captured alewives were taken from shallow to middepths (0-30 ft) in summer and fall and in deep water during winter and spring. Smelts were widely distributed, but the majority were captured in water deeper than 30 ft every month. No clear temperature or dissolved oxygen preference could be shown for any of the four species. (Auth.)

12834. Kotlyarevskaya, N. V. 1969. FUNCTIONING OF HATCHING GLANDS IN LOACH (Misgurnus fossilis L.) UNDER DIFFERENT OXYGEN CONDITIONS. Doklady Biological Sciences, 184(1-6): 19-21.

12835. Miller, Bruce S. (Univ. of Calif. School of Medicine, Davis, California). 1970. FOOD OF FLATHEAD SOLE (Hippoglossoides elassodon) IN EAST SOUND, ORCAS ISLAND, WASHINGTON. J. Fish. Res. Bd. Canada, 27(9): 1661-1665.

Flathead sole (Hippoglossoides elassodon) in East Sound fed on both benthic organisms (clams, polychaetes, and pea crabs) and nektonic organisms (mysids, fishes, and shrimps). The smallest sole (40-179 mm total length (TL) ate primarily mysids, but as the fish increased in size they utilized first shrimps and then fishes (mainly herring) and some clams. All except the largest sole (320-440 mm TL) also continued to feed heavily on mysids. Fish larger than 320 mm had the highest number of empty stomachs during the warmer months of the year whereas those smaller than 320 mm had the highest number empty during the colder months. In mature fish, the number of empty stomachs increased during the peak of spawning. (Auth.)

12836. Sykes, James E. (Bur. of Comm. Fish., St. Petersburg Beach, Florida). 1970. REPORT OF THE BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY, ST. PETERSBURG BEACH, FLORIDA, FISCAL YEAR 1969. U. S. Fish Wildl. Serv., Circ. 342, 22 pp.

Highlights of research in fiscal year 1969 included analysis and publication of data related to effects of engineering on the estuarine resource and completion of field work on the Florida portion of the cooperative Gulf of Mexico Estuarine Inventory. In addition, data supplied through testimony to the Florida Legislature assisted in the establishment of an aquatic preserve; and after a local hearing in which Laboratory data were presented, a municipality disapproved a potentially damaging engineering project. (Auth.)

12837. Whitt, Gregory S. (Dept. of Biology, Yale Univ., New Haven, Connecticut). 1969. HOMOLOGY OF LACTATE DEHYDROGENASE GENES: E GENE FUNCTION IN THE TELEOST NERVOUS SYSTEM. Reprint from: Science, Vol. 166, pp. 1156-1158.

Data obtained from immunochemical studies and the use of allelic variants support the hypothesis that the lactate dehydrogenase isozymes unique to the teleost nervous system are encoded in a third locus. Immunochemical and other studies demonstrate that this third locus is closely related to the lactate dehydrogenase B locus. (Auth.)

12838. Rothschild, Brian J., and Marian Y. Y. Yong (Bur.of Comm. Fish. Biol. Lab., Honolulu, Hawaii). 1970. APPARENT ABUNDANCE, DISTRIBUTION, AND MIGRATIONS OF ALBACORE, Thunnus alalunga, ON THE NORTH PACIFIC LONG-LINE GROUNDS. U. S. Fish Wildl. Serv. Spec. Sci. Rep. Fish. No. 623, 37 p.

This paper considers the dynamics of albacore, Thunnus alalunga, on the Japanese North Pacific longline grounds. In addition to changes in apparent abundance and distribution, the modes of immigration and emigration from the longline grounds are considered in terms of the migratory route of the albacore in the North Pacific Ocean. The data show a clear decline in apparent abundance on the longline grounds during the 1949-61 study period. This decline could not be related to changes in the average size of the fish or fishing effort. Spatial statistics were computed to describe the distribution of the albacore on the longline grounds. These show very clear cyclical changes each year. These changes reflect a net southwest movement of the two-dimensional first-moment at a velocity of about 6.5 miles (12 km.) day^{-1}. The second order spatial statistics showed a maximum longitudinal expansion and latitudinal contraction during the peak of the fishing season. The time-space coordinates of the two-dimensional first-moment of the albacore distribution appear to be highly predictable. The migration route of the albacore among North American, pole-and-line, and longline fisheries is considered. It appears that the dynamically most significant movement of the albacore is from the North American fishery, to the pole-and-line fishery, to the longline fishery. (Authors)

12839. Nims, Linda, J. L. Fryer, and K. S. Pilcher (Dept. of Microbiology, Oregon State Univ., Corvallis, Oregon). 1970. STUDIES OF REPLICATION OF FOUR SELECTED VIRUSES IN TWO CELL LINES DERIVED FROM SALMONID FISH. Proc. Soc. Exp. Biol. and Med., 135(1): 6-12.

Two established cell lines, derived from the embryonic tissues of chinook salmon and steelhead trout, respectively, have been examined for their ability to support the replication of two viruses of salmonid fish, and two viruses of warm-blooded vertebrates. The sockeye salmon virus (Oregon strain) produced large yields of progeny virus upon primary inoculation in the steelhead trout cells, and was readily propagated through five serial transfers. Infection was accompanied by a characteristic cytopathic effect on the cells. In the chinook salmon cells, replication of the virus was limited upon primary inoculation, but was greatly enhanced after a series of five culture passages. The Sacramento River chinook virus was also found to replicate in both of these cell lines upon primary inoculation, and the agent was transmitted through five serial passages. The cytopathic effect produced by this virus appeared essentially identical to that of the sockeye salmon virus. It was found that both salmonid cell lines would support replication of the western equine encephalitis virus very adequately at 26°. At 23° replication of the virus was very limited in the chinook salmon cells and none could be detected in the steelhead cells at the end of a 7-day incubation period. The virus was propagated through five serial transfers in both cell lines, with the production of a marked cytopathic effect. The virus of Newcastle disease failed to replicate in either cell line. (Authors summ.)

12840. Cisar, J. O., and J. L. Fryer (Dept. of Microbiology, Oregon State Univ., Corvallis, Oregon). 1969. AN EPIZOOTIC OF VIBRIOSIS IN CHINOOK SALMON. Bull. Wildlife Disease Assoc., Vol. 5, pp. 73-76.

Vibrio anguillarum was identified as the causal organism of an epizootic of vibriosis in juvenile chinook salmon (Oncorhynchus tshawytscha) reared in a salt-water impoundment on the Oregon coast. (Authors)

12841. Summerfelt, Robert C., and Mark C. Warner. 1970. GOLDEN SHINER PROBLEM EXAMINED BY RESEARCH TEAM. The American Fish Farmer, June 1970.

The parasite Plistophora ovariae is a potential danger to golden shiner culture because it greatly reduces the egg production of female shiners. Since it produces spores, the parasite is closely related to other spore-forming protozoan parasites such as the well-known whirling disease organism that afflicts trout (Myxosoma cerebralis) and the "milk-scale" disease of golden shiners (Myxobolus notemigoni).

12842. U. S. Department of the Interior, Division of Federal Aid Staff. 1969. BUREAU OF COMMERCIAL FISHERIES FEDERAL AID PROGRAM ACTIVITIES 1970. U. S. Fish Wildl. Serv. Circ., 103 p.

12843. Holmes, R. S., and G. S. Whitt (Dept. of Biology, Yale Univ., New Haven, Connecticut). 1970. DEVELOPMENTAL GENETICS OF THE ESTERASE ISOZYMES OF Fundulus heteroclitus. Biochemical Genetics 4: 471-480.

The ontogeny of the esterase isozymes of the teleost, Fundulus heteroclitus, has been investigated. One group of esterase isozymes is present at all stages of development, whereas other esterase isozymes only very gradually appear at later stages of development, or abruptly appear at such dramatic developmental events as hatching. The ontogeny of these isozyme patterns is interpreted as the expression of differential regulation of separate esterase genes. The general pattern of teleost esterase gene activation is similar to that reported for birds and mammals. Allelic variation was detected at two of the esterase loci. On the basis of electrophoretic mobility, substrate specificity, inhibitor specificity, genetic variation, and ontogeny of esterases, there appear to be at least 15 different esterase isozymes, which constitute 6-8 groups, each of which is probably encoded in one or more genetic loci. (Authors)

12844. Wingfield, W. H., J. L. Fryer, and K. S. Pilcher (Dept. of Microbiology, Oregon State Univ., Corvallis, Oregon). 1969. PROPERTIES OF THE SOCKEYE SALMON VIRUS (OREGON STRAIN). Reprint from: Proc. Soc. Exp. Biol. and Med., Vol. 130, pp. 1055-1059.

Several important characteristics of the sockeye salmon virus have been determined. It replicates abundantly in cultures of sockeye salmon cells, producing characteristic cytopathic effects. Most of the new virus produced is released into the culture fluid. The particle size was estimated by membrane filtration to be in the range of 110-165 mμ. The maximum rate of virus replication was found in the temperature range from 13 to 18°, and no replication occurred at 23°, although host cells grew well at that temperature. Virus infectivity was destroyed by ether, indicating the presence of essential lipids. Resistance of the agent to inhibition by 5-bromodeoxyuridine offers presumptive evidence that its nucleic acid is RNA. (Authors summ.)

12845. Mensinger, Gary, and Bradford E. Brown (Oklahoma Dept. of Wildlife Conservation, Oklahoma City, Oklahoma). 1968. LIVE WEIGHT-DRESSED WEIGHT RELATIONSHIP FOR COMMERCIAL FISHES FROM FOUR OKLAHOMA RESERVOIRS. Twenty-second Annual Meeting of the Southern Div., Amer. Fish. Soc., Baltimore, Maryland, October 23, 1968.

In order to determine appropriate relationships between live and dressed weights, regression and correlation analysis were performed on these data. This paper presents the results of seasonal and lake comparisons and gives the best estimating equations for converting dressed and live weights for the flathead catfish, Pylodictis olivaris; smallmouth buffalo, Ictiobus bubalus; bigmouth buffalo, Ictiobus cyprinellus; river carpsucker, Carpiodes carpio; freshwater drum, Aplodinotus grunniens; carp, Cyprinus carpio; paddlefish, Polyodon spathula. (From authors introduction)

12846. Huntsman, Gene R. (Bur. of Comm. Fish. Center for Estuarine and Menhaden Research, Beaufort, North Carolina). 1970. DISC GEL ELECTROPHORESIS OF BLOOD SERA AND MUSCLE EXTRACTS FROM SOME CATOSTOMID FISHES. Copeia, No. 3, 457-467; Comm. Fish. Abstr., 23(12): p. 4.

Disc gel electrophoretic analyses of the blood sera and the muscle extracts of 12 species of catostomids revealed that (1) muscle extract patterns of all but two of the species are quantitatively distinct; (2) sex of the fish makes no observable difference in the pattern; (3) in some instances, the patterns of fish of the same species but from different areas are quantitatively different. From this last finding, the author concludes that electrophoresis of muscle extracts might be a useful means of differentiating racial stocks. Blood serum patterns were too variable for taxonomic identification.

12847. Kashiwagi, Masaaki, and Ryuhei Sato (Dept. of Fish., Faculty of Agriculture, Tohoku Univ., Sendai, Japan). 1969. STUDIES ON THE OSMOREGULATION OF THE CHUM SALMON Oncorhynchus keta (Walbaum). II. HISTOLOGICAL OBSERVATIONS OF THE BRANCHIAL EPITHELIUM ACCORDING TO THE GROWTH OF THE FISH FROM HATCHING. Tohoku Journal of Agric. Research, 20(4): 212-221; Comm. Fish. Abstr., 23(12): p. 26.

The researchers examined histologically the branchial epithelium of chum salmon alevins and fry in relation to their development of tolerance to sea water as the fish became older. They concluded from these tests, that the chloride secretory cell of the gill of the chum salmon develops gradually as the fish grows older in fresh water, and prepares for the function of hyperosmoregulation at seaward migration. They believe this conclusion is supported by the fact that the number of the large, granular and acidophilic cells of the alevins increases as they grow older, and tends to be stable at about 40 days after hatching.

12848. Ivanchenko, L. A., and O. F. Ivanchenko. 1969. TRANSITION TO ACTIVE FEEDING BY LARVAL AND JUVENILE WHITE SEA HERRING (Clupea harengus pallasi Natio Maris-albi Berg) IN ARTIFICIAL CONDITIONS. Doklady Biological Sciences, 184(1-6): 207-209.

12849. Whitt, Gregory S. (Dept. of Biology, Yale Univ., New Haven, Connecticut). 1970. DEVELOPMENTAL GENETICS OF THE LACTATE DEHYDROGENASE ISOZYMES OF FISH. Reprint from: J. Exp. Zool., 175(1): 1-36.

Three genes (A, B, and E) encoding lactate dehydrogenase (LDH) subunits are shown to be present in fish by: (1) molecular hybridization, (2) allelic variants at two loci, and (3) kinetic, physical, and immunochemical studies. The same studies reveal that the E_4 isozyme is closely related to the B_4 isozyme. The E_4 isozyme is usually synthesized in the regions of the nervous system concerned with vision. However, in some species the E_4 isozyme is found in non-neural tissues such as lens. The closely related B and E loci tend to be simultaneously functional in the same retinal cells. The act of hatching by itself does not appear to act as the stimulus to E gene activation. The E subunit facilitates the assembly of A and B subunits into the same tetramer. The developmental and tissue specificity of the function of the LDH E gene suggests that the distinctive physical properties and the kinetic behavior of the LDH E_4 isozyme may play an important role in the metabolism of teleost vision. (Auth.)

12850. Klein, Richard G., and John E. Halver (Western Fish Nutrition Lab., Bur. of Sport Fisheries and Wildlife, Cook, Washington). 1970. NUTRITION OF SALMONID FISHES: ARGININE AND HISTIDINE REQUIREMENTS OF CHINOOK AND COHO SALMON. Journal of Nutrition, 100(9): 1105-1109; Comm. Fish. Abstr., 23(12): p. 28.

Growth studies were conducted with Chinook (Oncorhynchus tshawytscha) and coho (O. kisutch) salmon fingerlings to determine the minimal requirements for arginine and histidine. A 40% protein diet containing an essential amino acid pattern similar to that found in whole egg protein was used as the experimental diet. The coho salmon required about 2.3% arginine and 0.7% histidine. The Chinook salmon required 2.4% arginine in the diet and the histidine requirement was placed at about 0.7% of the ration. (Authors)

12851. Sindermann, Carl J. 1970. FISH DISEASES. Principal Diseases of Marine Fish and Shellfish, x + 369 pp., 163s. Publisher: Academic Press, London and New York. James C. Chubb (reviewer); Nature, 227(5259): 752; Comm. Fish. Abstr., 23(12): p. 29.

This summary of existing knowledge about diseases in marine animals expands reviews made by the author in 1966 and 1967. Chapter 1 contains nine hypotheses about the role of diseases in the marine environment. Chapter 2 describes the diseases of marine fishes, with special emphasis on those of commercially valuable food fishes. It contains drawings or photographs illustrating representative disease symptoms or organisms; 27 pages of references end the chapter. Chapter 3 has two sections, one on mollusks and one on crustaceans. It contains 21 pages of references for mollusks and 11 for crustaceans. The remaining six chapters deal with the importance of disease to the marine environment. Four of the topics considered are: mortalities of marine animals, with emphasis on the role of disease in North American clupeoid fishes and shellfish; disease and parasite problems in marine aquaria and cultivated populations; the relation of human diseases to those of fish; and the role of disease in the marine environment.

12852. Mauck, Paul E., and Robert C. Summerfelt (Oklahoma Coop. Fish. Unit, Oklahoma State Univ., Stillwater, Oklahoma). 1970. LENGTH-WEIGHT RELATIONSHIPS, AGE COMPOSITION, GROWTH, AND CONDITION FACTORS OF CARP IN LAKE CARL BLACKWELL. Proc. Okla. Acad. Sci. 50: 61-68.

This report presents length-weight relationships, age composition, and condition factors for carp in Lake Carl Blackwell, Oklahoma. The study is based upon examinations of a total of 619 carp collected, chiefly by electrofishing, in 12 monthly samples from December, 1967 through November, 1968. (Authors)

12853. Luk'yanenko, V. I., and P. P. Geraskin. 1969. NEW DATA ON THE HEMOGLOBIN FRACTIONS OF CARTILAGINOUS GANOIDS. Doklady Biological Sciences, 185(1-6): 345-346.

12854. Milne, P. H. 1970. FISH FARM ENCLOSURES. 7--THE USE OF STANDARD FRAME UNITS. World Fishing, 19(6): 46-47; Comm. Fish. Abstr., 23(12): p. 29.

Enclosures for fish farms located in sea arms should consist of a fish net to confine the fish being reared and a predator net to protect the fish net. Hanging the predator net alongside the fish net calls for some sort of rigid frame. The author investigated existing net structures (stake and poke nets used for catching salmon) but concluded that, although they are quite suitable for intertidal enclosures where they can be maintained easily, they are not adaptable to enclosures that are permanently immersed in the sea. Then he looked into the A-frame used by the Royal Navy for shallow-water, antitorpedo, boom defense; the H-frame scaffolding used by cleaning and construction crews for working on buildings; and a specially designed K-frame. As used by the Navy, the A-frames are assembled on shore, lowered into place by a derrick on board a barge, and held in position by a footchain and 1-ton sinkers. The author intended to hang both nets from the jackstay at the top of the frame, the predator net on the offshore leg and the fish net on the inshore leg. Thus either net could be reached from a wire-rope bridge attached at the apex of the A-frame. However, his trials showed that this type of enclosure is practical only if the bottom is firm enough to support the footchains and sinkers and if the water is sufficiently navigable to permit use of a derrick-carrying vessel. In addition, they showed that the amount of diving time required was excessive. The H-frame is relatively light and can be handled easily. The 2-ft. vertical modules are self-locking every 5 ft., so no clips or connections are necessary. The bottom frame is the platform that supports the rest of the scaffolding. Lateral stability is provided by angled braces driven into the bottom every 10 ft. An attempt to construct the enclosure without divers -- by pivoting each section of the H-frame into place from the one previously set and then driving a leg of the scaffolding into the bottom to give a firm footing -- showed that any slight variation from the vertical in one section was exaggerated, because of the interlocking nature, as the structure was extended. Thus the author recommends use of the H-frame enclosure only if the builder has the technical capability to align the footing piles with a high degree of precision. The K-frame permits small contractors to construct fish enclosures in unnavigable waters without sophisticated engineering equipment or piling vessels. Only two poles have to be driven into the seabed -- the vertical leg, which supports the fish net and the catwalk, and the offshore bracing leg, which supports the predator net. Cross bracing gives stability to both vertical and offshore legs. Use of standard 21-ft.-long poles, with a piling module of 10-ft., on center, simplifies construction -- divers at the Faery Isles test site were able to erect 20 feet of scaffolding per dive. The divers are needed to locate the underwater poles and tighten the connections (positive lock couplings are recommended, since screwclip enclosed couplings slip under load). They also can be used to attach the rigid-meshed seabed seal and the other nets that are attached to it. Use of a rigid mesh at the bottom makes maintenance and exchange of nets easier than if the net must be buried or held down with rocks and stones, as synthetic fiber nets must be.

12855. Malone, Thomas C. (Hopkins Marine Sta., Stanford Univ., Pacific Grove, California). 1970. IN VITRO CONVERSION OF DDT TO DDD BY THE INTESTINAL MICROFLORA OF THE NORTHERN ANCHOVY, Engraulis mordax. Nature, 227(5260): 848-849; Comm. Fish. Abstr., 23(12): p. 34.

The purpose of this study was to establish whether the intestinal microflora of the northern anchovy can dechlorinate DDT and to determine the relative importance of bacteria and fungi in the process. The fungi and the bacteria of the intestinal contents of the fish rapidly converted DDT to DDD (little or no DDE was formed). This rapid metabolism of DDT to DDD may be important in the survival of fishes because DDD is less toxic than DDT, and the degradation and assimilation of ingested food require several days. The results suggest, also, that although both bacteria and fungi metabolize DDT to DDE, the fungi are primarily responsible for further degrading DDD to a water-soluble product in anaerobic conditions.

12856. Southward, A. J. (The Plymouth Laboratory, Plymouth, England). 1970. IMPROVED METHODS OF SAMPLING POST-LARVAL YOUNG FISH AND MACRO-PLANKTON. J. Mar. biol. Assn.U. K., 50(3): 689-712.

Since the capacity of existing high speed plankton samplers was too small for routine studies of the seasonal abundance of young fish, efforts were made to improve the existing 1 m and 2 m Plymouth nets (ring trawls). A high speed version of the 1 m net suitable for towing at speeds above 4 knots is first described: this is easier to handle from small boats than heavy encased samplers of the Gulf III type, and filters a larger volume of water. Details of performance and calibration data are then given for the 1 m and 2 m diameter nets fitted with different types of material and used at various speeds. The 1 m and 2 m nets are now made of a knitted Terylene material with a hole of 0.67 mm by 1.07 mm (wet, after use). The Terylene material has a higher porosity than the previously used stramin, and is kinder to the catch than nylon monofilament mesh. The new nets are towed on oblique paths at 4 knots, using a Scripps depressor, and hauls made in this way are reproducible for depth and for volume of water filtered. The new standard 20 min tow of the 2 m Terylene net at 4 knots, with a filtration efficiency of 68%, filters 5260 m^3 of water; the old 30 min tow of the stramin net, using material of post-1945 construction, at about 2 knots, with an efficiency of 82%, filters 4800 m^3 of water. Although these small volume differences can be ignored in practice, the new net captures larger numbers of post-larval clupeids, early stages of other young fish, Sagitta and Calanus. Allowance for this must be made when comparing previous records. From comparative hauls it appears that the new 1 m net collects more young fish in proportion to its size than the new 2 m net, and is to be preferred except when very rare forms are being sought. Owing to widely differing mesh sizes it is impossible to compare catches of Gulf III type high-speed samplers and the new 1 m and 2 m nets except in very general terms. (Auth.)

12857. Slinn, D. J. (Marine Biol. Sta., Port Erin, Isle of Man, England). 1970. AN INFESTATION OF ADULT Lernaeocera (COPEPODA) ON WILD SOLE, Solea solea, KEPT UNDER HATCHERY CONDITIONS. J. Mar. biol. Assn.U. K., 50(3): 787-800.

The death of several sole, Solea solea (L.) in a marine fish hatchery may have been due to an infestation by the parasitic copepod Lernaeocera. The infestation was unusual in that it was composed of adult female Lernaeocera. Juvenile stages of Lernaeocera have been found on wild sole caught in the Irish Sea, and it is suggested that the infestation was introduced into the hatchery as juvenile stages on freshly caught sole. From morphological and other considerations, supported by evidence from infestation experiments, it would appear that the species involved is Lernaeocera lusci (Bassett-Smith); the sole may thus be a normal intermediate host for this species in the Irish Sea. Developmental substages of the female parasite are figured and briefly described. As the adult female Lernaeocera is a blood feeder and imposes a considerable physiological strain upon its host, it is a potential hazard to sole in hatcheries. (Auth.)

12858. Alabaster, J. S. (Water Poll. Res. Lab., Stevenage, Herts., England). 1970. TESTING THE TOXICITY OF EFFLUENTS TO FISH. Chemistry and Industry, No. 24, 759-764; Comm. Fish. Abstr., 23(12): p. 33.

The Ministry of Agriculture, Fisheries and Food, has developed a method for use principally in standard toxicity testing of effluents (and other materials including pesticides) toxic to fish. The test was developed in view of the following considerations: the test must be reliable and consistent and be so designed that data can be related to the effect of the effluent on fish of all kinds in rivers. In addition, the test should have adequate sensitivity, have high precision, be simple, and require a size of sample small enough for easy transport to a testing laboratory. In this paper, the author discusses use of the Ministry toxicity test relative to control of environmental factors, choice of test species of fish, the standard apparatus used, and method of expressing the results. The Ministry test was compared with two others -- the Trent River Authority method

and the Carter "rapid bioassay." The last section of the article considers the relation between laboratory results and effects on fisheries.

12859. LaRow, Edward J. (Dept. of Zoology, Rutgers Univ., New Brunswick, New Jersey). 1970. THE EFFECT OF OXYGEN TENSION ON THE VERTICAL MIGRATION OF Chaoborus LARVAE. Limnol. & Oceanogr., 15(3): 357-362.

A factorial experiment was designed to elucidate the environmental factors controlling vertical migration of Chaoborus punctipennis Say larvae. Variables were oxygen concentration, temperature, and presence or absence of food (plankton). Replicate experiments were conducted and hourly counts were made. Under low oxygen conditions ($\bar{\chi}$ = 0.57 ppm), 35.5% of the planktonic larvae were found in the stratum immediately above the sediments and 30.0% in the surface stratum 2 hr after sunset. At high oxygen concentrations ($\bar{\chi}$ = 6.81 ppm), an average of 88.2% of the larvae remained in the bottom stratum and only 1.1% migrated to the surface stratum 2 hr after sunset. Temperature change and presence or absence of food modified behavior; however, varying these factors under high oxygen concentrations failed to induce vertical migratory behavior. It was concluded that low oxygen tension was a major regulatory factor for the vertical migration in these Chaoborus larvae.

12860. Stevenson, Frederick, Walter T. Momot, and Frank J. Svoboda III. 1969. NESTING SUCCESS OF THE BLUEGILL, Lepomis machrochirus Rafinesque, IN A SMALL OHIO FARM POND. Ohio J. Sci., 69(6): 347-355.

Some of the factors influencing the reproductive success of the bluegill sunfish, Lepomis machrochirus Rafinesque, in an Ohio farm pond were investigated during three summers from 1965 to 1967. The availability of nesting substrate was the major variable affecting spawning success in the pond. Fine gravel and sand substrates produced the most fry. Those of mud and debris less fry. Chemical control of algal mats in 1965 and 1967, by providing open areas of preferred substrate, increased nesting success and thus directly contributed to overpopulation of bluegills in the pond. (Authors)

12861. Idler, D. R., and H. C. Freeman (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1968. BINDING OF TESTOSTERONE, 1α-HYDROXYCORTICOSTERONE AND CORTISOL BY PLASMA PROTEINS OF FISH. Gen. comp. Endocr., 11: 366-372; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 413-419, FRB Studies No. 1308.

Binding to protein of three principal steroids of fish was determined in six species of teleosts and an elasmobranch. Transcortin-type (stable on Sephadex at 40°C) binding of cortisol in salmonids and Atlantic cod was very low (2.3 - 5.6%) and averaged about 5% of that reported for human plasma at 4°C. Transcortin-type binding of 1α - hydrocorticosterone and testosterone by plasma of thorny skate was also low and similar to cortisol binding by plasma of salmonids and cod. It is suggested that the protein(s) responsible for transcortin-type binding in the species investigated differs from mammalian transcortin. Total binding of cortisol by salmonid fish was relatively high and ranged from 30-55%. Binding was greater in females than in males of the same species but binding in both sexes decreased considerably during the final stages of sexual development. Total testosterone binding by plasma of both thorny skate and Atlantic salmon was 94% and 92% respectively. This binding may explain how certain fish are able to tolerate the high levels of testosterone frequently present in their blood. Total 1α- hydroxycorticosterone binding of thorny skate plasma was somewhat higher in the female (25%) than in the male (18%). (Authors)

12862. Brown, Bradford E. (Oklahoma Coop. Fish. Unit, Oklahoma State Univ. Res. Foundation, Stillwater, Oklahoma). 1970. COMPARISON OF CREEL SURVEY STATISTICS FOR PARTIES USING DIFFERENT TYPES AND METHODS OF FISHING IN THE OKLAHOMA STATE LAKE CREEL SURVEY. Proc. Okla. Acad. Sci. 50: 91-97.

A comparison of creel survey statistics for fishing parties using different types and methods of fishing is presented. Implications for creel-survey design are discussed. (Auth.)

12863. Freese, M., and D. Makow (Freshwater Inst., Fish. Res. Bd., Winnipeg, Manitoba, Canada). 1968. HIGH-FREQUENCY ULTRASONIC PROPERTIES OF FRESHWATER FISH TISSUE. J. acoust. Soc. Amer., 44: 1282-1289; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 97-104, FRB Studies No. 1269.

Various ultrasonic properties of whitefish (Coregonus clupeaformis) tissues have been determined. The sound velocity, impedance, and absorption were measured at 22°C with pulse-echo techniques for the frequencies of 1, 2, 3, 7 - and 11 MHz. The average impedance and absorption of fresh whitefish myomere with a fat content of approximately 8% were 1.634×10^5 cgs units and 0.7 dB/cm/MHz, respectively. No significant velocity or absorption anisotropy was observed for the muscle tissues. The effects of freezing on velocity and absorption were investigated. The mean velocity in thawed flesh was only 0.8% higher than in fresh flesh, but increases up to 100% or more were noted in the absorption. This increase depended on the rate at which freezing proceeded; a longer freezing period generally resulted in greater absorption. (Authors)

12864. Yamazaki, Fumio, and Edward M. Donaldson (Fish. Res. Bd. of Canada, Vancouver Lab., Vancouver, Brit. Columbia, Canada). 1968. THE EFFECTS OF PARTIALLY PURIFIED SALMON PITUITARY GONADOTROPIN ON SPERMATOGENESIS, VITELLOGENESIS, AND OVULATION IN HYPOPHYSECTOMIZED GOLDFISH (Carassius auratus). Gen. comp. Endocr., 11: 292-299; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 255-262, FRB Studies No. 1292.

Salmon pituitary gonadotropin purified by Sephadex G-100 was effective for spermatogenesis as well as spermiation in hypophysectomized male goldfish (Carassius auratus). The same gonadotropin was also effective for vitellogenesis and ovulation in hypophysectomized female goldfish. The hormonal requirement for vitellogenesis (9 injections of 0.5 mg partially purified salmon gonadotropin per 10 g body weight) and for ovulation (1 injection of 0.3 mg per 10 g body weight) was greater than that for spermatogenesis (9 injections of 0.1 mg per 10 g body weight) and for spermiation (0.03 mg per 10 g body weight). The possibility that there is one functional gonadotropin in the fish pituitary gland which controls the whole maturation phenomenon is discussed. (Authors)

12865. Tarr, H. L. A. (Fish Res. Bd. of Canada, Vancouver Lab., Vancouver, Brit. Columbia, Canada). 1969. DE NOVO BIOSYNTHESIS OF INOSINIC AND URIDYLIC ACIDS BY SALMON TESTES AND LIVER. Canad. J. Biochem., 47: 197-201; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 225-229, FRB Studies No. 1289.

Salmonid fish liver homogenates and immature testes slices when incubated 4 or 5 h at 25° or 20 h at 5° in a medium containing inorganic salts, radioactive substrates, and intermediates usually associated with recognized enzymic pathways of the de novo biosynthesis of purine and pyrimidine rings formed radioactive uridylic acid and inosinic acid. These were largely degraded by the tissue preparations to uracil and hypoxanthine which were purified for chemical studies. Degradation of hypoxanthine formed in this manner showed that C-6 was formed from radioactive carbonate and C-4 and C-5 from radioactive glycine. Degradation of uracil showed that metabolism of radioactive carbonate did not result in exclusive labeling of C-2 of uracil, but also caused more or less extensive labeling of the C-4, C-5, and C-6 fraction, especially with liver preparations. L-Aspartate was incorporated almost exclusively into the C-4, C-5, and C-6 fraction of uracil, but not into hypoxanthine. (Auth.)

12866. Beckett, J. S., and S. N. Tibbo (Fish. Res. Bd. of Canada, St. Andrews, New Brunswick, Canada). 1968. RECENT CHANGES IN SIZE COMPOSITION OF CANADIAN ATLANTIC SWORDFISH CATCHES. Int. Comm. for the Northwest Atlantic Fisheries Redbook, Part III: 62-66; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 191-195, FRB Studies No. 1282.

12867. Seki, Humitake (Fish. Res. Bd. of Canada, Pacif. Oceanog. Group, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1969. MARINE MICROORGANISMS ASSOCIATED WITH THE FOOD OF YOUNG SALMON. Applied Microbiology, 17: 252-255; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 407-410, FRB Studies No. 1305.

The biomass of microorganisms in the digestive tracts of young salmon in the sea of Saanich Inlet was examined by (1) the direct microscopic method, (2) the plate count method and (3) the physiological method (microbial biomass assumed from the release of carbon dioxide). By all methods, most microbial biomass in foods was shown to decrease during its stay in the digestive organ. This observation was supported by the detection of many bacteria at different stages of digestion. The microbial biomass was quantitatively influenced by the composition of food ingested and by the sampling time. (Auth.)

12868. Sprague, J. B., and D. W. McLeese (Fish Res. Bd. of Canada). 1968. TOXICITY OF BLEACHED KRAFT MILL EFFLUENT TO LARVAL AND ADULT LOBSTERS AND ATLANTIC SALMON. Pulp and Paper Magazine of Canada, December: T431-T433; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 157-159, FRB Studies No. 1276.

A laboratory study of toxicity was undertaken to determine the effects of a new pulp mill at Picton, Nova Scotia, on fishing in the locality. The lethal threshold for bleached kraft mill effluent (BKME) was found to be about 12-15 percent for Atlantic salmon parr, agreeing in general with other work. For lobster larvae the lethal threshold is in the vicinity of 10 percent BKME concentration. These larvae are reasonably resistant to the effluent, and not highly sensitive as had been feared. Despite similar thresholds, BKME apparently contains different toxic materials for lobster larvae and small salmon. Thus, a waste treatment process which protects one kind of animal cannot be assumed safe for another animal without testing. Adult lobsters are even more resistant to BKME than are larvae. (Authors)

12869. Donaldson, Edward M., and Ulf H. M. Fagerlund (Fish. Res. Bd. of Canada, Vancouver Lab., Vancouver, Brit. Columbia, Canada). 1968. CHANGES IN THE CORTISOL DYNAMICS OF SOCKEYE SALMON (Oncorhynchus nerka) RESULTING FROM SEXUAL MATURATION. Gen. comp. Endocr., 11: 552-561; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 425-434, FRB Studies No. 1310.

Maturing, mature, spawned, dexamethasone-injected, and gonadectomized salmon were injected with 0.5μCi [4-^{14}C] cortisol. Blood samples were taken at various times after injection for determination of plasma dichloromethane-extractable radioactivity. The volume of distribution ($V_1 + V_2$), biological half-life (T 1/2), and metabolic clearance rates of the dichloromethane-extractable radioactivity were calculated on the basis of a two-compartment model V_1 increased from 4.7% in maturing fish to 19.0% in spawned fish ($p<0.001$). V_2 increased from 9.7% in maturing fish to 46.0% in spawned fish ($p<0.001$). The $T_{1/2}$ was 1.5 hr in maturing fish and 3.0 in spawned fish ($0.05>p>0.001$). Metabolic clearance rate increased from 20.5 ml/kg body wt/hr in maturing fish to 47.3 in spawned fish ($p<0.01$). Plasma cortisol concentration increased from 2.9 μg/100 ml in maturing fish to 8.5 in spawned fish. The data indicates that the secretion rate of cortisol is probably greater in the spawned than in the maturing fish. The secretion rate of cortisol was determined in one castrated, two mature, and one spawned salmon. When calculated on the basis of the resting cortisol concentration, the cortisol secretion rate varied from 0.7 μg/kg body wt/hr in the gonadectomized fish to 11.0 in the spawned fish. Injected [4-^{14}C] cortisol was rapidly converted to cortisone. When [4-^{14}C] cortisone was injected, there was no measurable conversion to cortisol.

12870. Kudinskii, O. Yu. 1969. EMBRYONIC DEVELOPMENT OF "SMALL" WHITE SEA HERRING (Clupea harengus pallasi n. maris-albi varβ) IN RELATION TO TEMPERATURE. Doklady Biological Sciences, 184(1-6): 200-203.

12871. Koo, Ted S. Y. (Univ. of Maryland, Nat. Res. Inst., Chesapeake Biol. Lab., Solomons, Maryland). 1970. THE STRIPED BASS FISHERY IN THE ATLANTIC STATES. Chesapeake Sci., 11(2): 73-93.

Commercial landings of striped bass on the Atlantic coast of America were reviewed briefly for the period prior to 1930 and analyzed in some detail from 1930 to 1966. From the lowest level of barely over 1 million pounds in 1934, annual landings for the entire coast have increased ninefold at the present level. Catch statistics and fluctuations in landings were analyzed according to regions and states. Chesapeake region, comprising Maryland and Virginia, landed two-thirds of the total catch. The fluctuations in Chesapeake landings were paralleled by Middle Atlantic and New England regions, but with a two-year lag. This was attributed to the fact that the main source of striped bass to all three regions was from the same Chesapeake stock. North Carolina, which is the sole contributor to South Atlantic region in striper landings, had its own distinctive fluctuation pattern. Fishing gears used in catching striped bass vary from state to state, as do seasonal landing patterns. It has not been possible to calculate catch-per-unit-effort due to lack of necessary data, but the catch-per-unit-gear was calculated and analyzed for a representative state in each region. In all cases, fluctuations in landings were much more closely related to catch-per-unit-gear than to amount of gear. The cyclic nature of high and low years in Maryland landings was recognized. Dominant possible causes were discussed. (From auth.)

12872. Flemer, David A. (Univ. of Maryland, Nat. Res. Inst., Chesapeake Biol. Lab., Solomons, Maryland). 1970. PRIMARY PRODUCTION IN THE CHESAPEAKE BAY. Chesapeake Sci., 11(2): 117-129.

Estimates of annual primary production and standing crops based on chlorophyllα were made in the northern half of Chesapeake Bay over a 160 km section. Both the chlorophyllα concentrations and incubator productivity were maximum during the warmer season, especially in the oligohaline area. The higher salinity waters usually showed lower values of both parameters, except during the winter when values were fairly uniform over the entire study area. Chlorophyllα values ranged from 1 to 80 mg m^{-3} up-bay at Station I-B, and 1 to 25 mg m^{-3} down-bay at Station XI. Incubator photosynthesis ranged from 2 to 200 mg C m^{-3} hr^{-1} up-bay and 2 to 40 mg C m^{-3} hr^{-1} down-bay. Chlorophyllα concentrations and incubator productivity were usually low at the tidal freshwater station, rapidly increased in the oligohaline area and tended to decrease with increasing salinity. The seasonal pattern was characterized by one general maximum during the warm months with little tendency for a spring bloom and, occasionally, some stations showed a late fall pulse in standing crop and photosynthesis. Photosynthetic activity per unit chlorophyllα at the down-bay stations ranged from 1.3 to 10.3 mg C hr^{-1} mg Chlα^{-1} and the seasonal average was 3.9. The assimilation numbers at the up-bay stations ranged from <1 to 11.9 mg C hr^{-1} (mg Chlα^{-1} and averaged 3.3 and 1.1 during the warm and cold periods, respectively). Computed values of integral gross photosynthesis averaged about 0.2 g C m^{-2} day^{-1} at the up-bay stations and approximately 1.0 g C m^{-2} day^{-1} at the down-bay stations over the period of November, 1966 to October, 1967. Turbidity of the waters appeared to have a controlling influence on primary production in the water column. However, photosynthetic activity was highest in turbid up-bay water on a volume basis. (Auth.)

12873. Denoncourt, Robert F., and William H. Bason (Ichthyological Associates, Middletown, Delaware). 1970. BLIND STRIPED BASS, Roccus saxatilis (Walbaum), FROM THE DELAWARE RIVER ESTUARY. Chesapeake Sci., 11(2): 132-134.

Four blind striped bass were collected during the 1968 fall trawling season. Age, morphometrics and general condition were compared with normal specimens collected in the same season and locality. All blind specimens were stunted, II+ in age, and generally closer to I+ normal bass in morphometrics. (Authors)

12874. Whitt, Gregory S. (Yale Univ., New Haven, Connecticut). 1968. DEVELOPMENTAL GENETICS OF LACTATE DEHYDROGENASE ISOZYMES UNIQUE TO THE EYE AND BRAIN OF TELEOSTS. Genetics No. 60, p. 237.

The subunits of lactate dehydrogenase (LDH) in the cells of most vertebrates are encoded in two loci. These subunits combine to form tetrameric isozymes. An additional locus, functioning only in the primary spermatocyte, is present in many birds and mammals. There also appears in many fish to be at least one additional LDH locus whose function is restricted to regions of the eye and brain. The isozymes unique to the eye and brain migrate more rapidly anodally during electrophoresis than the other LDH isozymes. The most anodal isozyme or more conveniently, the "eye band", is present in greater abundance in the eye than the brain, and is mainly present in the retina of most fish examined. However, in the sea trout Cynoscion regalis the "eye band", plus heteropolymeric LDH isozymes, is also present to a lesser extent in the lens, indicating that the activation of the gene responsible for the "eye band" is not restricted to: (1) neural tissue, (2) tissues with identical metabolic requirements, or (3) tissues with common embryological derivation. Analysis of LDH isozyme ontogeny in Fundulus heteroclitus indicates the gene responsible for the "eye band" is activated prior to hatching. The three isozymes LDH-5, LDH-4, and the "eye band", were isolated and partially purified from Atlantic mackerel, Scomber scombrus. A hierarchy of biochemical characteristics was established with LDH-5 > LDH-4 > "eye band" for (1) Km pyruvate, (2) pyruvate optima, (3) resistance to pyruvate inhibition, (4) susceptibility to heat inactivation; and based on preliminary results, (5) resistance to oxamate inhibition, (6) susceptibility to urea inhibition, and (7) affinity for certain coenzyme analogues. These data indicate that the "eye band" may be more closely related to LDH-4 than LDH-5. (Auth.)

12875. Sprague, John B. (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1968. PROMISING ANTI-POLLUTANT: CHELATING AGENT NTA PROTECTS FISH FROM COPPER AND ZINC. Nature, No. 220: 1345-1346; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 251-253, FRB Studies No. 1291, 1969.

The trisodium salt of nitrilotriacetic acid (NTA) seems to be a promising "anti-pollutant", to prevent fish-kills from copper and zinc in case of short-term breakdown of normal pollution controls.

12876. Lennon, Robert E. (U. S. Bur. of Sport Fish. and Wildl., Fish Control Lab., La Crosse, Wisconsin). 1970. FISHES IN PEST SITUATIONS. In: Vol. 5, Vertebrate Pests: Problems and Control, Chapter 2, pp. 6-41. Published at Univ. of Calif., Davis, California.

Chapter 2 includes: Fishes that affect man's safety: Biting fishes, Electric fishes, Venomous fishes, Poisonous fishes, Fishes as hosts for human parasites; Fishes that affect man's welfare: Marine fishes, Freshwater fishes; Combating pest problems: Biological controls, Physical controls, Chemical controls, Legal controls, Methodology and mechanics; Appendix A Common and scientific names of fishes; Appendix B Formulas of fish toxicants; References. (From contents)

12877. Drew, H. R., and J. E. Tilton. 1970. THERMAL REQUIREMENTS TO PROTECT AQUATIC LIFE IN TEXAS RESERVOIRS. J. Wat. Poll. Contr. Fed., 42(4): 562-572.

Use of some Texas reservoirs as sources of cooling water for steam electric generation plants apparently has benefited the game fish populations in those lakes. Aquatic life in Texas waters is acclimated to high temperatures, some as high as 110°F (43°C). After impoundment of a reservoir, non-native game species are stocked, but within 3 to 4 yr rough species become dominant. Fertility of the lakes declines as nutrients are trapped in the bottom sediments because of stratification, which also produces low dissolved oxygen concentrations and low temperatures in deeper parts of the lakes. Recirculation of water by power plants reduces stratification, aids in redistributing nutrients, and increases aeration. Two such lakes, about 20 yr old, have supported balanced fish populations.

Regulation of thermal discharges would be better accomplished by limiting the heat loading to about 0.5 to 1 Mw generating capacity/acre of lake surface (1.25 to 2.5/ha) than by limiting temperature or temperature change. (Authors)

12878. Tarzwell, C. M. 1970. THERMAL REQUIREMENTS TO PROTECT AQUATIC LIFE. J. Wat. Poll. Contr. Fed., 42(5, part 1): 824-828.

Temperature influences aquatic organisms both directly and indirectly. In determining water quality requirements, temperature and oxygen must be considered together because aquatic organisms are cold-blooded and their metabolism is dependent on the temperature of the surrounding waters. The biota in various portions of the country have, through long periods of development, become adjusted to certain temperatures and daily and seasonal fluctuations in temperature. The fluctuations to which they have become accustomed must be maintained. In setting temperature criteria or standards, it is desirable to have a standard which is applicable nationwide. The National Technical Advisory Committee on Water Quality Requirements for Aquatic Life indicated uniform allowable increases above the monthly average of the daily maximum temperatures. These increases are influenced by season, most sensitive species and life stages in the biota, and the main taxonomic groups present. (Auth.)

12879. Konar, S. K. 1970. HEPTACHLOR TOXICITY TO AQUATIC LIFE. J. Wat. Poll. Contr. Fed., 42(8, part 2): R299-R303.

Laboratory bioassays made at 18.9° to 23.9° showed a wide toxicity range of the insecticide for test organisms. The 168-hr LC_0, LC_{50}, and LC_{100} ranged, respectively, from 0.0004 to 0.8 mg/l, 0.007 to 0.0116 mg/l, and 0.001 to 2.0 mg/l for 10 fish species, and from 0.001 to 0.8 mg/l, 0.00379 to 1.27 mg/l, and 0.0063 to 2.0 mg/l for nine insect species tested. A single treatment of 1 mg/l heptachlor showed residual toxicity to test fish (the khalisa) for 68 days. Of the 11 plankton species tested, all phytoplankters were killed by 0.001 mg/l, and most zooplankters were killed by 0.10 mg/l. Safe application rates were suggested to insure safety to aquatic life. (Auth.)

12880. Ziebell, C. D., R. E. Pine, A. D. Mills, and R. K. Cunningham. 1970. FIELD TOXICITY STUDIES AND JUVENILE SALMON DISTRIBUTION IN PORT ANGELES HARBOR, WASHINGTON. J. Wat. Poll. Contr. Fed., 42(2, part 1): 229-236.

In partial fulfillment of the objectives of a joint federal-state conference on Puget Sound and the Strait of Juan de Fuca, a study was made in Port Angeles Harbor, Washington, to determine water quality conditions, the presence and distribution of juvenile Pacific salmon in areas of pulp mill waste discharges, and the effect that such discharges may have on those salmon. The primary cause of toxicity was determined to be sulfides originating from the anaerobic decomposition of sludge deposits at the bottom of the harbor. Sulfide levels of 0.3 mg/l were toxic to juvenile salmon but distress was noted at concentrations of 0.1 and 0.2 mg/l. Toxicity also was dependent on the stage of the tide. (Authors)

12881. Wicklund, Robert I. (Sandy Hook Mar. Lab., Highlands, New Jersey). 1970. OBSERVATIONS ON THE SPAWNING OF THE CUNNER IN WATERS OF NORTHERN NEW JERSEY. Chesapeake Sci., 11(2):p. 137.

12882. Krantz, George E. (U. S. Dept. of Interior, Bur. of Comm. Fish., Biol. Lab., Oxford, Maryland). 1970. LYMPHOCYSTIS IN STRIPED BASS, Roccus saxatilis, IN CHESAPEAKE BAY. Chesapeake Sci., 11(2): 137-139.

12883. Idler, D. R., and B. Truscott (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1968. 1α-HYDROXYCORTICOSTERONE AND TESTOSTERONE IN BODY FLUIDS OF A CARTILAGINOUS FISH (Raja radiata). J. Endocrin., 42: 165-166; 1969 Studies, Fish. Res. Bd. Canada, Part I, 439-440, FRB Studies No. 1313, 1969.

12884. Franks, James S. (Gulf Coast Res. Laboratory). 1970. AN INVESTIGATION OF THE FISH POPULATION WITHIN THE INLAND WATERS OF HORN ISLAND, MISSISSIPPI, A BARRIER ISLAND IN THE NORTHERN GULF OF MEXICO. Gulf Research Reports, 3(1): 3-104.

An investigation to ascertain the species composition and the relative abundance of the fish population within the inland waters of Horn Island, Mississippi, a member of the offshore barrier island chain, was made from August 1965 to September 1966, and 69 species representing 58 genera and 35 families were encountered. In respect to the fishes certain biological and physical factors were noted. Forty-nine collecting stations were established on the island, and these were categorized according to the nature of their appearance and location. A salinity range from fresh to 29.9 ppt. was recorded for the sampled bodies of water, with the high salinity areas being under the influence of Mississippi Sound waters. Fishes with both marine and brackish water affinities were collected. Euryhaline species were taken from both fresh water and water which was approaching fresh; however, no true fresh water fishes were obtained. Members of the Atherinidae, Cyprinodontidae, and Poeciliidae (Menidia beryllina, Cyprinodon variegatus, Fundulus similis, Gambusia affinis, and Poecilia latipinna) contributed most conspicuously to the fish population. Other families which were encountered formed somewhat less conspicuous elements in the population. The killifishes and poeciliids were capable of completing their life histories in the majority of examined areas, and these species contributed most obviously to the permanent occupancy of the inland waters due to their established resident breeding populations. (Auth.)

12885. Christmas, J. Y., and H. D. Howse (Gulf Coast Res. Laboratory). 1970. THE OCCURRENCE OF LYMPHOCYSTIS IN Micropogon undulatus AND Cynoscion arenarius FROM MISSISSIPPI ESTUARIES. Gulf Research Reports, 3(1): 131-154.

Lymphocystis was observed in Atlantic croakers (Micropogon undulatus and sand seatrouts (Cynoscion arenarius) collected from brackish waters of the Mississippi Gulf Coast. This is the first report of lymphocystis in fishes of the Gulf of Mexico and adds one family and two species to host records. Microscopic examination of the tumors revealed several histologic differences in the lesions of the two species. Mature tumor cells in the croaker were larger than those in the sand seatrout. In the croakers, these cells were closely packed and their hyaline capsules were usually confluent. In the sand seatrouts, the tumor cells were rarely confluent and were usually widely separated either by interstitial connective tissue or by an amorphous, hyaline matrix that filled the intercellular spaces. A preliminary description of the histology of the neoplasm was included. Ecological factors of the sampling stations where fishes infected with lymphocystis occurred were compared with stations where lymphocystis was not encountered. The chemical and physical differences observed at these stations were discussed. (Authors)

12886. Guthrie, J. E., and O. E. Acres (Environmental Control, Health & Safety Branch, Whiteshell Nuclear Res. Estab., Pinawa, Manitoba, Canada). 1970. TOXICITY TO FISH OF TWO ORGANIC REACTOR COOLANTS. Bull. of Environmental Contamination and Toxicology, 5(2): 145-151.

The use of terphenyl compounds to cool nuclear reactors prompted an enquiry into the effect of these substances in the aquatic environment, should they be accidentally released. Santowax OM + 30% high boilers and HB-40 are two terphenyl compounds under study as nuclear reactor coolants at Whiteshell Nuclear Research Establishment. The acute toxicity of these two coolants to rainbow trout fry has been investigated, and it was found that Santowax OM was the more toxic. The behaviour of fish exposed to suspensions of Santowax OM in water is briefly described. (Authors summ.)

12887. Galkina, L. A. 1969. METHOD OF DETERMINING THE NUMBER OF MYOMERES IN HERRING LARVAE AND THE CHANGE OF THEIR NUMBER DURING DEVELOPMENT. Doklady Biological Sciences, 184(1-6): 194-196.

12888. Hiroi, Osamu, and Kiichiro Yamamoto. 1970. STUDIES ON THE MATURATION OF SALMONID FISHES - II. CHANGES IN THE TESTIS OF THE MASU SALMON, Oncorhynchus masou, DURING ANADROMOUS MIGRATION. Bull. Fac. Fish. Hokkaido, 20(4): 252-263. (In English, with plates).

Changes in the testes of the Masu salmon, Oncorhynchus masou, during the anadromous migration were investigated histologically in the present study. The period of active multiplication of spermatogonia in this fish seems to begin soon after the sea-run migration of the fish, and continues before one or two months of their anadromous migration. The processes of testicular maturation are divided into six successive stages based on germ cell stages. The course of maturation in the present species proceeds synchronously in all cells within a cyst, but it is different more or less from lobule to lobule. The intralobular cells change clearly along with their sexual maturation. Several testis-ova of the early perinucleus stage were found among the germinal elements in the testicular lobule of a male fish. (From authors summ.)

12889. Nishiyama, Tsuneo (Res. Inst. of No. Pacif. Fish., Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1970. TENTATIVE ESTIMATION OF DAILY RATION OF SOCKEYE SALMON (Oncorhynchus nerka) IN BRISTOL BAY PRIOR TO ASCENDING MIGRATION. Bull. Fac. Fish. Hokkaido, 20(4): 265-276. (In English, with illus.)

For determination of the food requirement of the Bristol Bay sockeye salmon during the last half of a month in the last marine life stage, a preliminary calculation of daily ration was made by referring to Winberg's basic equation (1956) that relates ration to growth and metabolism, and to Brett's empirical equation (1965) of the relationship between the rate of oxygen consumption and a sustained swimming speed. The daily rate of growth of 2.2 age fish in late June of both year 1967 and 1968 combined is estimated to be 0.58% of body weight in females and 0.85% in males. The daily rate of gonadal development is also estimated to be 1.46% of gonad weight in females and 3.75% in males. Caloric values of food animals in nature for sockeye salmon determined by chemical analyses are as follows: copepods 85 kcal, euphausiids 127 kcal, amphipods 83 kcal, pteropods 71 kcal, polychaeta 76 kcal, zoea 81 kcal, squids 93 kcal, and fish larvae 110 kcal per 100 gram wet weight, respectively. Assuming that the fish with the size of 58-60 cm in fork length move in a 6°C sea at a speed of 64 cm/sec (30 miles/day) and consume the above-mentioned prey animals, the daily ration of sockeye salmon equivalent to the energy required for swimming and the growth as well as the development of gonads during the migration in Bristol Bay is expected to be about 2% of body weight. (Auth. summ.)

12890. Uchida, Naoyuki (Lab. of Biochemistry, Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1970. BIOCHEMICAL STUDIES ON PROTEOLYTIC ENZYMES IN PYLORIC CAECA OF FISH - I. FUNDAMENTAL STUDY ON THE PROPERTIES OF PROTEOLYTIC ENZYMES IN CHUM SALMON PYLORIC CAECA. Bull. Fac. Fish. Hokkaido, 20(4): 313-319. (In Japanese with illus.)

Fundamental studies were made on the properties of proteolytic enzymes in salmon (Oncorhynchus keta) pyloric caeca. It was found that the crude proteolytic enzymes were effectively extracted with distilled water as well as 1 mM $CaCl_2$ solution and these proteolytic enzymes were unstable under acidic condition, particularly below pH5 and included some amount of BTEE-hydrolytic enzyme which was rapidly destroyed over 40°C. Active enzymes for each substrate (casein, TAME, BTEE, and CBZ-Gly-Phe.) were precipitated by slightly changing the concentration of ammonium sulfate at pH8.5 without loss of their activity. From these results, it was assumed that the properties of the proteolytic enzymes in chum salmon pyloric caeca were considerably different from those of enzymes found in bovine and whale pancreas, and that the extracts contained active enzymes in the digestive juices and the zymogens from pancreatic cells which are unavoidably activated in the mixture. (Auth.)

12891. Okada, Shun, and Tsuneo Nishiyama (Lab. of Marine Zoology, Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1970. NOTES ON MORPHOLOGICAL DIFFERENCES BETWEEN THE JUVENILES OF CHUM AND PINK SALMON IN SHORE WATERS. Bull. Fac. Fish. Hokkaido, 20(4): 277-285. (In English, with illus.)

Ninety-two chum salmon and ninety pink salmon juveniles were caught by a trap set-net for sand-lances fishery in shore waters off Mori Town, situated along the coast of Uchiura Bay on June 16-18, 1969. The juveniles of the two species can be easily identified by the following characteristics in external appearance: (1) A silvery color on the sides extends towards the dorsal part of the body in chum salmon, while a distinct deep blue border remains along the dorsal edge in pink salmon. This feature is most distinct in fresh specimens, becoming obscure after 24 hours of preservation in formalin due to the fading of the silvery color. (2) The body shape at similar size is slightly more slender in pink salmon than in chum salmon. (3) Myotomes under the skin are superficially visible in pink salmon, whereas they are invisible because the skin is mostly covered with silvery scales in chum salmon. The juveniles of chum salmon are evidently larger than those of pink salmon, the mean value showing 68.4 mm in the former, 63.8 mm in the latter. Gill rakers in both species attain approximately full number in adults, acquiring 21.4 in mean value in chum salmon, 28.1 in pink salmon. Scales in chum salmon are provided with 7 circuli in mean value, while in pink salmon only 1.1, there being included some individuals having no scales on their bodies. Obviously the development of scales begins considerably earlier in chum salmon than in pink salmon. (From authors summ.)

12892. Nagahama, Yoshitaka, and Kiichiro Yamamoto (Lab. of Fresh Water Fish Culture, Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1970. MORPHOLOGICAL STUDIES ON THE PITUITARY OF THE CHUM SALMON, Oncorhynchus keta - I. FINE STRUCTURE OF THE ADENOHYPOPHYSIS. Bull. Fac. Fish. Hokkaido, 20(4): 293-301. (In Japanese with English abstract).

The glandular cells in the adenohypophysis of the chum salmon, Oncorhynchus keta, during their anadromous migration, have been investigated in the present study. Observations with the aid of light- and electron microscopy revealed nine glandular cells in the pro-, meso- and meta-adenohypophysis. (From authors)

12893. Sych, Roman (Zaklad Gospodarki Rybackiej w Rzekach i Zbiornikach Zaporowych, Instytut Rybactiva Srodladowego, Zabieniec k. Warszawy, poczta Piaseczno 1). 1970. SOME COMPARISONS ON THE BACKGROUND OF AN ELEVEN-YEAR STUDY ON THE GROWTH OF SEA-TROUT (Salmo trutta L.) Acta Hydrobiologica, 12(2-3): 225-249.

Growth studies on sea-trout from the River Vistula made by various authors in different years were compiled and discussed. Variations of mean sizes in the Baltic salmon as compared with that of sea-trout were analysed and the impact of the variations on catches was shown. Finally, the author discusses the correlation between successive annual length increments and actual sizes of fish and relates his findings to the problems of rearing fish.

12894. Duke, T. W., J. I. Lowe, and A. J. Wilson, Jr. (Bur. of Comm. Fish., Center for Estuarine and Menhaden Res., Pesticide Field Sta., Gulf Breeze, Florida). A POLYCHLORINATED BIPHENYL (AROCLOR 1254®) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA. Bull. Environmental Contamination and Toxicology, 5(2): 171-180.

In this paper is reported the occurrence of Aroclor 1254 in the estuarine environment, and its possible effects on some estuarine organisms is discussed. (Authors)

12895. Manikiam, John S. (Dept. of Zoology, Victoria Univ. of Wellington, New Zealand). 1969. A GUIDE TO THE FLATFISHES (ORDER HETEROSOMATA) OF NEW ZEALAND. Tuatara, 17(3): 118-130.

12896. Klawe, W. L., J. J. Pella, and W. S. Leet. 1970. THE DISTRIBUTION, ABUNDANCE AND ECOLOGY OF LARVAL TUNAS FROM THE ENTRANCE TO THE GULF OF CALIFORNIA. Inter-American Tropical Tuna Commission Bulletin, 14(4): 507-531.

This study is based on collections of larvae of Thunnus albacares, Euthynnus lineatus, and Auxis sp. obtained from surface and oblique net tows made during seven cruises, each along a comparable track in the entrance of the Gulf of California and each during a different month. Concomitant measurements of surface temperature, salinity and zooplankton were made at each of the plankton stations. The catches of larval Auxis sp. were examined by analysis of variance techniques to determine which environmental features were associated with the spawning of this tuna as indicated by the distribution of larvae and to gain some insight into the behavior of the larvae themselves. The testing indicated that the spawning of Auxis sp. varied significantly among the different months of the cruises. The testing also indicated that if the larvae were capable of avoiding the sampling apparatus, this ability was not related to features associated with time of day such as light conditions. The analysis did not detect any change in the vertical distribution of the larvae among the months of the experiment. It was concluded that the larvae did not exhibit a diel vertical movement. The measurements of temperature, salinity, and zooplankton volumes were treated as covariates in the analysis. The surface temperature proved to be a highly important factor in explaining the distribution of larvae, but salinity and zooplankton volumes were not. Catches of Thunnus albacares and Euthynnus lineatus were rare during the course of the study; these are discussed in qualitative terms with respect to the time of the year and the surface temperature. The distribution of larval tunas in the area of study was compared with the distribution of surface water masses. It appeared that these masses had no influence per se on the distribution of larvae. (Authors)

12897. Stevenson, Merritt R. 1970. ON THE PHYSICAL AND BIOLOGICAL OCEANOGRAPHY NEAR THE ENTRANCE OF THE GULF OF CALIFORNIA, OCTOBER 1966 - AUGUST 1967. Inter-American Tropical Tuna Commission Bulletin, 14(3): 389-481, with charts.

A study of the temporal and spatial distribution of larval tunas and the concomitant oceanic conditions was made in cooperation with the Direccion General de Pesca e Industrias Conexas of Mexico. Field work consisted of eight hydrographic cruises made from October 1966 through August 1967 near the entrance of the Gulf of California. From January through April, surface currents were southerly at velocities up to 20 cm/sec; currents in June were variable in direction and mostly less than 10 cm/sec; by August the surface current was northerly at 10-15 cm/sec. Surface winds were usually secondary to the distribution of mass as an influence on the surface circulation. Currents at 100 m were generally similar in direction to those at the surface, but the water moved more slowly. Between the surface and 100 m, southbound currents crossed the entrance of the Gulf at velocities of 5-10 cm/sec during January and April, forming frontal boundaries with the California Current water, which often occurred south of the entrance. From April to August, the median concentration of surface chlorophyll increased from 0.65 to 0.97 mg/m^3, while the median productivity increased from 5.6 mg C/m^3/day in April to 17.8 mg C/m^3/day in June before returning to 2.6 mg C/m^3/day in August. Primary productivity was closely correlated with the concentration of surface chlorophyll a. Productivity was generally higher in the vicinity of the Gulf than that found for water in the open Pacific. Productivity was highest near Islas Las Tres Marias and second highest near Cabo San Lucas, both locations of local upwelling. The standing crop of phytoplankton was shown to be subjected to progressively heavier grazing pressure in the spring and summer by zooplankton. (Auth.)

12898. Waldichuk, Michael (Fish. Res. Bd. Canada, Pacific Oceanogr. Group, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1968. BIOLOGICAL EFFECTS OF WATER POLLUTION. Chemistry in Canada, 20: 1-4; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 403-406, FRB Studies No. 1304.

12899. Schreibman, Martin P., and Klaus D. Kallman (Brooklyn Coll. and Osborn Labs. of Marine Science, New York Aquarium, Brooklyn, New York). 1969. THE EFFECT OF HYPOPHYSECTOMY ON FRESHWATER SURVIVAL IN TELEOSTS OF THE ORDER ATHERINIFORMES. Gen. comp. Endocr., 13(1): 27-38.

Ten species of teleosts belonging to three families of Atheriniformes (Poeciliidae, Cyprinodontidae, Goodeidae) have been tested for their ability to survive in fresh water without a pituitary gland. The fish of the current report respond similarly to Atheriniformes previously investigated. Hypophysectomized fish enter into osmotic shock and generally die within three weeks when placed into fresh water but they will survive in dilute sea water (1.2% solution of commercial sea salts). Fish belonging to Poecilia survive for the shortest period. By comparison the mean survival time for Xiphophorus is longer and more variable. No correlation exists between the number of days hypophysectomized fish are held in one third sea water prior to testing and the length of time they survive in fresh water. This is also true for fish challenged a second time after recovering from osmotic shock. Presumably, osmotic difficulty commences upon exposure to fresh water but can be alleviated when fish are returned to dilute sea water. Five hypophysectomized fish survived in fresh water. The significance of these observations is discussed as it is related to the natural habitat and salt tolerances of the fish studied. (Authors)

12900. Leatherland, J. F., and J. M. Dodd (Dept. of Zoology, The University, Leeds, England). 1969. ACTIVITY OF THE HYPOTHALAMO-NEUROHYPOPHYSIAL COMPLEX OF THE EUROPEAN EEL (Anguilla anguilla L.) ASSESSED BY THE USE OF AN IN SITU STAINING TECHNIQUE AND BY AUTORADIOGRAPHY. Gen. comp. Endocr., 13(1): 45-59.

Activity of the hypothalamo-neurohypophysial complex of Anguilla anguilla L., acclimatised to different environmental conditions and after sudden changes of environment, has been investigated by the use of an in situ staining technique for neurosecretion and by autoradiography. Changes in background colour from black to white and vice versa; from darkenss to black or white; from black or white to darkness; electric fishing with and without subsequent transportation, and cold temperature shock all resulted in a change, usually a decrease, in stainability of all or part of the complex within 4 hr, whereas a change from fresh to seawater and vice versa; intraperitoneal, or subarachnoid injections of NaCl or distilled water, overcrowding and transportation had no effect on stainability of the complex, though the injection experiments were short-term (1-3 hr.). Changes in background colouration had no effect on the amount of stainable neurosecretion in the pre-optic nucleus or tracts of hypophysectomised eels. Preliminary experiments using autoradiography, after administration of 35S-cysteine or ^{14}C-serine, indicated that the complex may be more active in eels acclimatised to fresh water, or transferred from seawater to freshwater, than in those acclimatised to seawater. The techniques and results are critically assessed and it is concluded inter alia that most stressful situations cause a rapid initial depletion of stainability of the complex though normal levels are restored within 24 hr. (Authors)

12901. Whitt, Gregory S. (Dept. of Biology, Yale Univ., New Haven, Connecticut). 1970. DIRECTED ASSEMBLY OF POLYPEPTIDES OF THE ISOZYMES OF LACTATE DEHYDROGENASE. Arch. Biochem., 138(1): 352-354.

The purpose of this report is to describe a new mechanism that affects the assembly of lactate dehydrogenase polypeptide subunits in vivo and in vitro.

12902. Margolis, L. (Fish. Res. Bd. of Canada, Biol. Station, Nanaimo, Brit. Columbia, Canada). 1968. REVIEW OF THE JAPANESE SPECIES OF Cystidicola, Metabronema AND Rhabdochona (NEMATODA) FROM SALMONOID FISHES. The Research Bull. of the Meguro Parasitological Museum, 2: 23-44; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 35-56. FRB Studies No. 1267, 1969.

12903. Idler, D. R., and H. C. Freeman (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1969. SEX HORMONE BINDING PROTEINS I. BINDING OF STEROIDS BY SERUM OF AN ELASMOBRANCH (Raja radiata). Gen. comp. Endocr., 13(1): 75-82.

There was high testosterone binding in thorny skate (Raja radiata) serum with no apparent difference between the sexes. In contrast to human testosterone binding globulin, human transcortin, and "transcortin type" of binding in Atlantic salmon (Salmo salar) there was little loss in steroid binding as the temperature was elevated from 3 to 40°. When diluted serum was heated at 60° for 45 minutes, prior to binding determinations at 3°, there was only a slight loss in testosterone binding activity. Like the binding of corticosteroids by transcortin and testosterone by testosterone-binding globulin in human plasma, there was no significant change in binding over the pH range 6-8. Two types of testosterone binding systems were indicated, one of low capacity and high affinity and one of high capacity and lower affinity. Competitive binding experiments demonstrated that the skate serum protein(s) had a higher binding affinity than either bovine serum albumin (BSA) or human serum albumin (HSA). It is suggested that the use of the "saturation method" in determining the binding capacity of fish proteins for steroid hormones may give misleading results since some of the proteins appear to have almost unlimited capacity. The specificity of the skate testosterone binding protein was different from human testosterone binding globulin. Progesterone, estradiol-17β, and testosterone were bound to a high degree and would seem to be the likely naturally occurring targets for such a protein; thus the skate serum protein seems to be a sex hormone binding protein. (Authors)

12904. Freeman, H. C., and D. R. Idler (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1969. SEX HORMONE BINDING PROTEINS II. ISOLATION FROM SERUM OF AN ELASMOBRANCH (Raja radiata). Gen. comp. Endocr., 13(1): 83-91.

A sex hormone binding protein (SHBP), homogeneous by polyacrylamide gel electrophoresis, was isolated from the serum of the mature male thorny skate (Raja radiata) by DEAE-cellulose chromatography and Sephadex G-200 gel filtration. The molecular weight of the protein as determined by Sephadex G-200 thin layer chromatography and Sephadex G-200 gel filtration was found to be about 80,000. The SHBP monomer is believed to associate into more complex molecules with a loss in steroid binding activity. Association was prevented and reversed to some extent by including 2-mercaptoethanol or dithiothreitol in buffers used in isolating the protein. A high binding affinity for testosterone was demonstrated by gel filtration. Under competitive binding conditions, the skate SHBP, like human testosterone binding globulin, had a greater binding affinity for 5α-androstane-3β, 17β-diol than testosterone while epitestosterone with its 17α-configuration was not bound appreciably. Unlike what has been found for human testosterone binding globulin some compounds which possess a lateral chain at C-17 compete with testosterone for the SHBP. When testosterone binding to SHBP is rated at 100, the binding of estradiol-17β, progesterone, 17α-hydroxyprogesterone, and 11α-hydroxycorticosterone was rated at 125, 118, 108 and 2, respectively. (Authors)

12905. Larkin, P. A., and J. G. McDonald (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1968. FACTORS IN THE POPULATION BIOLOGY OF THE SOCKEYE SALMON OF THE SKEENA RIVER. J. Anim. Ecol., 37: 229-258; 1969 Studies, Fish. Res. Bd. Canada, Part I, pp. 111-140, FRB Studies No. 1271, 1969.

12906. Dontsova, G. V., and A. A. Neifakh. 1969. SYNTHESIS OF HIGH-POLYMER RNA IN ISOLATED BLASTODERMS AND DISSOCIATED CELLS OF THE EMBRYONIC LOACH. Doklady Biological Sciences, 184(1-6): 25-28.

12907. Mataruyeva, I. A. (Lab. of Food Stocks and Fish. Nutr. of the Amur Div. of the Pacif. Ocean Fish. and Oceanogr. Inst. [TINRO], Khabarovsk, USSR). 1969. EFFECTIVENESS OF ORGANIC FERTILIZERS IN FISH BREEDING PONDS OF AMUR FISHERIES. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(4): 14-21.

In this article data are presented on the volume and rate of supply of total nitrogen and total organic matter from fertilizers of plant origin. The rate of development of the bacterial flora in the plant decomposition zone is described.

12908. Kudrinskaya, O. I. (Inst. of Hydrobiol., Academy of Science, Ukr. SSR, Kiev, USSR). 1969. METABOLIC RATE IN THE LARVAE OF PIKE-PERCH, PERCH, CARP-BREAM, AND ROACH. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(4): 68-72.

The metabolic rate equations for larvae of the species investigated have the following form: pike-perch – $Q = 0.314W^{0.82}$, perch – $Q = 0.289W^{0.78}$, roach – $Q = 0.289W^{0.82}$, carp-bream – $Q = 0.445W^{0.93}$. The equations may be used to calculate the food requirements of larvae of these species.

12909. Vladimirova, K. S. (Hydrobiol. Inst., Academy of Science, Ukr SSR, Kiev, USSR). 1969. PROCEDURE FOR STUDYING THE PRIMARY PRODUCTION OF BENTHIC ALGAE. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(4): 78-80.

An apparatus composed of molybdenum glass cylinders for study of the primary production of the phytomicrobenthos is described. The technique is similar to the widely-employed slide-fouling method.

12910. Shentyakova, L. F. (Inst. of Biol. of Inland Waters, Academy of Science of the USSR, Borok, USSR). 1969. THE TECHNIQUE OF COMPILING NOMOGRAMS FOR RECONSTRUCTION OF THE GROWTH OF FISHES FROM THEIR SCALES. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(4): 87-95.

12911. Vladimirov, V. I. (Inst. of Hydrobiol., Academy of Science, Ukr SSR, Kiev, USSR). 1969. EFFECT OF POLYMICROFERTILIZERS (PMU-7) ON THE DEVELOPMENT AND SURVIVAL OF FISH IN THE EARLY STAGES OF LIFE. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(2): 15-23.

Various doses of non-filtered and filtered solutions of PMU-7 containing 20% zinc were tested on the eggs and larvae of carp and loach. The two solutions could affect the survival of larvae both negatively and positively, depending on the species of fish, the stages of development in which they were used, the doses, and the conditions in the medium during the experiments. The response of the fish (in terms of properties studied) to PMU-7 is to a significant extent similar to that to zinc sulfate.

12912. Gordeyeva, L. N., Yu. S. Dmitrenko, and A. A. Zabolotskiy (Karelian Br., State Sci. Res. Inst. of Lake and River Fisheries, Petrozavodsk, USSR). 1969. THE ATTRACTION OF AQUATIC FOOD ORGANISMS BY ELECTRIC LIGHT. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(3): 50-53.

The use of electric light for creating dense concentrations of summer copepod plankton was found to be effective under the conditions of lakes in Karelia both during dark and light ("white") nights. The dense accumulations of copepods produced by the action of the light may successfully serve as food for the cultivated fry of valuable species of fish.

12913. Vaynshteyn, B. A. (Inst. of Biol. of Inland Waters, Academy of Science of the USSR, Borok, USSR). 1969. EVALUATION OF THE NUMBER AND THE DISTRIBUTION OF FRESH-WATER INVERTEBRATES IN A WATER RESERVOIR. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(2): 38-39.

12914. Strasburg, Donald W. (Bur. of Comm. Fish. Biol. Lab., Honolulu, Hawaii). 1970. A REPORT ON THE BILLFISHES OF THE CENTRAL PACIFIC OCEAN. Bulletin of Marine Science, 20(3): 575-604.

Interest in the 11 species of billfishes has steadily mounted since World War II, and, as they have come under increasing fishing pressure, arguments have arisen concerning the effects of fishing on their stocks. As large predators, the billfishes are difficult to study; our knowledge is largely restricted to catch statistics, anatomy, diet, and development of their young. The large marlins show great sexual dimorphism in size, and their sex ratio may diverge from the 1:1 condition. The catch of some species is strongly seasonal. Spawning is poorly understood, although the young stages have been identified. Analyses of length-frequency distributions and tagging returns suggest rapid growth, short lives, and extensive migrations. Abundance seems to decline after heavy fishing, but better statistics are needed before the true effects of fishing can be judged. (Auth,)

12915. Romanenko, V. I. (Inst. of Biol. of Inland Waters, Academy of Science of the USSR, Borok, USSR). 1969. PRODUCTION OF BACTERIA AND PHYTOPLANKTON IN FRESH-WATER RESERVOIRS. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(2): 43-44.

12916. Sukhenko, G. Ye., and V. V. Polishchuk (Inst. of Zool. and Inst. of Hydrobiol., Academy of Science of the Ukr SSR, Kiev, USSR). 1969. CRUSTACEANS PARASITIC TO FISH IN THE PLANKTON OF ESTUARIES IN THE DANUBE REGION. Hydrobiological Journal (Amer. Fish. Soc., translated and produced by Scripta Technica, Inc.), 5(3): 53-56.

12917. Ernst, W. (Inst. für Meeresforsch. Bremerhaven, West Germany). 1970. METABOLISM OF PESTICIDES IN MARINE ORGANISMS II. BIOTRANSFORMATION AND ACCUMULATION OF DDT-^{14}C IN FLATFISH: Platichthys flesus. Veroff. Inst. Meeresforsch., 12(3): 353-360.

Daily oral application of 1-2 µg-doses over a period of 1-2 weeks resulted in a distribution of DDT over various tissues in the ppm-range. Single oral doses were rapidly absorbed from the gastrointestinal tract within 6 hours. Transformation to polar metabolites was not observed in significant amounts. Some DDD and DDE could be detected in various tissues by TLC and radioscanning. (Auth.)

12918. Ernst, W. (Inst. für Meeresforsch. Bremerhaven, West Germany). 1970. METABOLISM OF PESTICIDES IN MARINE ORGANISMS. III. DEGRADATION AND ACCUMULATION OF DDT-^{14}C IN FLATFISHES, Solea solea, IN SHORT-TERM-STUDIES. Veroff. Inst. Meeresforsch., 12(3): 361-364.

Single DDT-doses from 1.8 to 9.0 µg were given orally to Solea solea. Nine days after application up to 10% of the total dose was degraded to DDD and to a lesser extent to DDE. No polar components could be detected. DDT-concentration in brain was five times higher than in the total fish at all doses administered. (Auth.)

12919. Lewis, Robert M., William F. Hettler, Jr., E. Peter H. Wilkens, and G. Nelson Johnson (Center for Estuarine and Menhaden Res., Bur. Comm. Fish., Beaufort, North Carolina). 1970. A CHANNEL NET FOR CATCHING LARVAL FISHES. Chesapeake Science, 11(3): 196-197.

A channel net developed to catch larval Atlantic menhaden, Brevoortia tyrannus, proved to be very successful. It captured larval fishes during daylight in a channel where only a few specimens could be caught during the day with a 1-m plankton net. (Authors)

12920. Silliman, Ralph P. (Bur. of Comm. Fish. Biol. Lab., Seattle, Washington). 1970. GROWTH IN EXPERIMENTAL POPULATIONS OF Tilapia mossambica. Bioscience, 20(20): 1109-1110.

12921. Modin, John C. (Calif. State Dept. of Fish and Game, Menlo Park, California). 1969. RESIDUES IN FISH, WILDLIFE, AND ESTUARIES - CHLORINATED HYDROCARBON PESTICIDES IN CALIFORNIA BAYS AND ESTUARIES. Pesticides Monitoring Journal, 3(1): 1-7; Selected Water Resources Abstracts, 3(20): p. 35, 1970.

As part of a nationwide program to monitor organochlorine pesticide residues in estuaries, the U. S. Bureau of Commercial Fisheries in January 1966 contracted to the California Department of Fish and Game the responsibility to monitor selected estuaries in California for pesticides. Analyses of oysters, mussels, and clams sampled at points of interest within each estuary revealed DDT, DDD, DDE, dieldrin, and endrin in concentrations from 10 to 3,600 ppb. Calculations are based on the laboratory wet weight of homogenized tissue. In studies of offshore exposure, high levels of DDT, DDD, and DDE were found in a king crab (2,739 ppb) and in ova from a king salmon (668 ppb). Pesticides were also measured in the ova of prawn, flounder, halibut, and sole; of these, halibut ova were the most highly contaminated, with DDE, DDD, and DDT measuring 591 ppb. -- Sjolseth

12922. Buhler, Donald R. (Oregon State Univ., Environmental Health Sciences Center, Corvallis, Oregon). 1970. RADIONUCLIDE ACCUMULATION IN COLUMBIA RIVER BIOTA. In: Water Studies in Oregon; Oregon State Univ. Water Resources Research Institute Fall Quarter 1969 Seminar, pp. 41-54; Selected Water Resources Abstracts, 3(20): p. 38, 1970.

The radionuclides released into the aquatic environment daily by the nuclear reactors at Hanford, Wash. were studied and found do not present a serious hazard to aquatic or terrestrial life living in or along the Columbia River. Maximum permissible levels of radioactivity released into the water are specified so that it is impossible for man to ingest sufficient quantities of fish or other radioactive species from the area to exceed permissible levels of radioactivity in the body. The absence of demonstrable hazardous effects on man or his environment during the 25 years of continuous safe release of radioactive wastes from the nuclear reactors at Hanford should provide some basis for an evaluation of the impact of a modern nuclear power plant which releases less than 0.02 percent as much radioactivity to the aquatic environment. -- Knapp

12923. Hashimoto, Yoshiro, Tomotoshi Okaichi, Le Dung Dang, and Tamao Noguchi (Lab. of Marine Biochemistry, Tokyo Univ., Japan). 1968. GLENODININE, AN ICHTHYOTOXIC SUBSTANCE PRODUCED BY A DINOFLAGELLATE, Peridinium polonicum. Bull. Jap. Soc. Sci. Fish., 34(6): 528-534, (in Japanese); Selected Water Resources Abstracts, 3(20): p. 40, 1970.

In September 1962, extensive water blooms of a dinoflagellate identified as Peridinium polonicum, accompanied by mass mortality of fish, occurred in Lake Sagami near Tokyo. An attempt was made to isolate the suspected ichthyotoxic substance from the plankton collected from the lake. The substance was confirmed to be an alkaloid and to contain a sulfhydryl radical. The authors designated it as glenodinine. Bioassays showed glenodinine to be extremely toxic to both freshwater and marine fishes. -- Sjolseth

12924. Tomkiewicz, Linda A. (State Univ. Coll., Fredonia, New York). 1970. TYPICAL FISH MORTALITY RATES IN EASTERN LAKE ERIE. Lake Erie Environmental Studies, Technical Data Report No. 4, 15 p.; Selected Water Resources Abstracts, 3(20): p. 42, 1970.

This study was conducted to establish a base line of natural fish mortalities in eastern Lake Erie throughout a yearly cycle. Seasonal variations in mortality rate indices are shown graphically for the eight most common species (smelt, black bullheads, white suckers, sheepshead, yellow perch, white bass, smallmouth bass, and rock bass). No direct cause for the mortality could be given although the author stated possible causes as predation, diseases and parasitism, pollution, and physical damage caused by man. Most causes of high fish mortality rates were related to commercial and sports fishing activity. The need for further research is stated. -- Sjolseth

12925. Sherk, J. Albert, Jr., and Eugene L. Cronin (Natural Resources Inst., Maryland Univ., Solomons, Maryland). 1970. THE EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS ON ESTUARINE ORGANISMS; AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES. Nat. Res. Inst. of the Univ. of Maryland. Reference No. 70-19, April, 1970, 62 p. 179 ref. Contract No. DACW73-70-C-0013 by U. S. Army Corps of Engineers; Selected Water Resources Abstracts, 3(20): p. 42, 1970.

This annotated bibliography was prepared by screening approximately 1200 published and unpublished articles, papers, and books. Abstracts of 161 references are presented for all papers on the effects of suspended loads and deposited sediments on estuarine organisms. Articles are classified into 9 categories (annelid worms, crustaceans, benthic species, engineering activities, mollusks, offshore disposal, fish, primary production, and sediment effects on water quality). Also included is a list of 18 references constituting a bibliography of bibliographies. -- Sjolseth

12926. Lattimer, John M. (Office of Library Services, Department of the Interior, Washington, D. C.). 1970. ESTUARINE RADIOECOLOGY - A BIBLIOGRAPHY OF REPORT LITERATURE. U. S. Dept. of Interior, Office of Library Services Bibliography Series No. 16, 52 p.; Selected Water Resources Abstracts, 3(20): p. 71.

This bibliography on estuarine radioecology lists technical reports published from 1960 through June 1969, with a few published after that date. These reports are concerned with the biological accumulation and cycling of radionuclides, radioactive sedimentation, and the effects of radiation on the biota associated with estuaries. A special feature of this bibliography is the listing of research projects in progress as of June 1969. An index of authors and a separate index of subjects is also provided. -- Knapp

12927. Whitt, G. S. (Yale Univ., New Haven, Connecticut). 1970. GENETIC VARIATION OF SUPERNATANT AND MITOCHONDRIAL MALATE DEHYDROGENASE ISOZYMES IN THE TELEOST Fundulus heteroclitus. Experientia, Vol. 26, pp. 734-736.

Fundulus heteroclitus has codominant allelic variants at both the S-MDH locus and the M-MDH locus. The genetic variants encoded in both loci are evenly distributed among males and females which suggests that they are autosomally inherited. The high degree of isozyme polymorphism observed for malate dehydrogenase has also been observed for other Fundulus isozymes, e. g., lactate dehydrogenase and esterases. Thus, F. heteroclitus appears to be an excellent organism to employ for investigating the linkage relationships of genes encoding these isozymes.

12928. Bullis, Harvey R., Jr., and John R. Thompson (Bur. of Comm. Fish., Pascagoula, Mississippi). 1970. BUREAU OF COMMERCIAL FISHERIES EXPLORATORY FISHING AND GEAR RESEARCH BASE, PASCAGOULA, MISSISSIPPI, JULY 1, 1967 TO JUNE 30, 1969. Dept. of the Interior, U. S. Fish Wildl. Serv. Circ. No. 351, 29 p., illus.

The research activities of the Base emphasize the development of new techniques for locating and assessing unutilized marine stocks and include studies in aerial photography, multispectral photography, marine bioluminescence, fish oil film, and sonar technology. Described are the outfitting of the new research vessel Oregon II; the continuation of conventional exploration for shrimp and fish in the Gulf of Mexico, Caribbean, and western Atlantic; the efforts to implement the development of the Florida calico scallop industry; and the activities of the Exploratory Data Center. (Authors)

12929. Morton, William Markham (4700 Northwest Barnes Road, Portland, Oregon). 1970. ON THE VALIDITY OF ALL SUBSPECIFIC DESCRIPTIONS OF NORTH AMERICAN Salvelinus malma (Walbaum). Copeia, No. 3, pp. 581-587.

12930. Chien, Shih Ming, and Wilmer A. Rogers (Dept. of Zoology-Entomology, Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1970. FOUR NEW SPECIES OF MONOGENETIC TREMATODES, GENUS Pellucidhaptor, FROM FISHES OF THE SOUTHEASTERN U. S. J. Parasit., 56(3): 480-485.

Four new species of the dactylogyrid genus Pellucidhaptor are described: P. alahamus from Ictiobus bubalus; P. dicerobasis from Carpiodes carpio and I. bubalus; P. minytremae from Minytrema melanops; and P. tarsialis from Hypentelium etowanum. A brief synopsis of the genus is given and the proposal is made that Dactylogyrus merus Zaika, 1961, be transferred to Pellucidhaptor. (Authors)

12931. Mathews, Stephen B., and Henry O. Wendler. 1970. RELATIVE EFFICIENCY AND ECONOMIC YIELD OF THE COLUMBIA RIVER DRIFT GILL NET AND INDIAN SET NET FISHERIES. Washington Dept. of Fisheries Technical Report No. 3, 17 p.

At current levels of fishing effort in the Indian fishery above Bonneville Dam and the regular commercial fishery below the dam, a drift net is more efficient than a set net on spring chinook, but the two types of gear are about equally efficient on fall chinook according to a comparison of coefficients of catchability of the two gears. However, comparative physical efficiency of the two gears is not the key issue in determining an equitable balance between the two fisheries of the allowable harvest from the runs. One has to look further to the net earnings per fisherman from Columbia River fishing for determining a fair balance. These were calculated to be nearly the same for the two fisheries under prevailing regulations, $1,146 for the average drift net fisherman below Bonneville and $1,266 for the average Indian set net fisherman. (Authors summ. and conclusions)

12932. U. S. Department of the Interior, Bureau of Commercial Fisheries. 1970. RESEARCH IN FISCAL YEAR 1969 AT THE BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY, BEAUFORT, N. C. U. S. Fish Wildl. Serv. Circ. No. 350, 49 p., illus.

Research on blue crab, conducted for thirteen years at the Laboratory, is summarized briefly. Progress of research in the menhaden investigation – the life history, ecology, behavior-physiology, tagging, and population dynamics programs – is reported. Research in the Industrial Schoolfishes Program is reviewed.

12933. U. S. Department of the Interior, Bureau of Commercial Fisheries. 1970. UPSTREAM PASSAGE OF ANADROMOUS FISH THROUGH NAVIGATION LOCKS AND USE OF THE STREAM FOR SPAWNING AND NURSERY HABITAT CAPE FEAR RIVER, N. C., 1962-66. U. S. Fish Wildl. Serv. Circ. No. 352, 12 p., illus.

Studies were made of the feasibility of using navigation locks to pass anadromous fish upstream during their spawning migration in lieu of installing fishways. It was found that shad and other anadromous fish will use the locks to move upstream and locks may be used to restore, at least in part, spawning runs above barriers. Continued studies are needed to refine techniques for locking fish upstream.

12934. Wilz, Kenneth J. (Dept. of Zoology, Oxford Univ., England). 1970. REPRODUCTIVE ISOLATION IN TWO SPECIES OF STICKLEBACK (GASTEROSTEIDAE). Copeia, No. 3, pp. 587-590.

12935. Laurs, R. Michael, and Robert N. Nishimoto (Bur. of Comm. Fish., Fishery-Oceanogr. Center, La Jolla, California). 1970. FIVE JUVENILE SAILFISH, Istiophorus platypterus, FROM THE EASTERN TROPICAL PACIFIC. Copeia No. 3, pp. 590-594.

12936. Rogers, Wilmer A. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1967. Polyclithrum mugilini GEN ET SP. N. (GYRODACTYLIDAE: POLYCLITHRINAE SUBFAM. N.) FROM Mugil cephalus L. J. Parasit., 53(2): 274-276, illus.

Polyclithrum mugilini gen. et sp. n. is reported from Mugil cephalus L. from Lake Seminole, Georgia. This species was determined to be sufficiently different from all described gyrodactylids to warrant erection of a new subfamily, Polyclithrinae. It is distinguished by having the haptor supported by numerous sclerotized processes, by the anchor bases having deep and superficial roots, by having several accessory bars articulated to the anchors, and by the marginal hooks being distributed in two groups. (Auth.)

12937. Barrett, Izadore, and H. Tsuyuki. 1967. SERUM TRANSFERRIN POLYMORPHISM IN SOME SCOMBROID FISHES. Copeia, No. 3, pp. 551-557; 1968 Studies, Part I, Fish. Res. Bd. of Canada, pp. 93-99, FRB Studies No. 1204, 1968.

Polymorphism of serum transferrins was found in four of five species of scombroid fishes studied. Evidence for genetic control of these polymorphisms was obtained from tests of fit with the Hardy-Weinberg distribution. Three transferrin phenotypes were present in the yellowfin tuna (Thunnus albacares) and the bonito (Sarda chiliensis). The data for these species fit a two-allele system. Six phenotypes were found in the skipjack (Katsuwonus pelamis) and albacore (T. alalunga), and the data for these species fit a three-allele system. The transferrin of the bluefin tuna (I. thynnus) was not polymorphic. The usefulness of differences in transferrin gene frequencies for population studies, especially of the yellowfin and skipjack, is discussed. (Authors)

12938. Priegel, Gordon R. 1970. REPRODUCTION AND EARLY LIFE HISTORY OF THE WALLEYE IN THE LAKE WINNEBAGO REGION. Dept. of Natural Resources, Madison, Wisconsin, Technical Bulletin 45, 105 p.

Because the walleye is the most sought-after game fish in Lake Winnebago and connecting waters, its early life history was studied from 1959 to 1967 to determine factors affecting spawning success, egg development and fry survival. Areas studied included spawning sites on the west shore of Lake Winnebago and numerous spawning marshes along the Fox and Wolf rivers. Spawning success was influenced by the number, size and condition of available spawning areas. Egg development on all spawning areas was affected by fluctuating water levels and substrate types, but not by water temperatures or predation. On Fox River marshes, embryo development was inhibited by carp activity and low dissolved oxygen concentrations. Fry survival was influenced by water levels on the marshes and by river velocity. Because spawning areas were large and numerous and of high quality (i.e., water flow and bottom types were favorable for spawning), factors limiting egg development or fry survival did not affect the establishment of year classes of walleyes on Lake Winnebago. Even if spawning failed on some areas, the fact that so many other large and high quality spawning sites were available meant that some successful spawning would always occur somewhere. For these reasons management efforts to maintain necessary water levels on some spawning areas or to control carp on others were of secondary importance to the necessity of state ownership of existing spawning marshes. Through such ownership high quality spawning sites could be maintained. Specific management recommendations for state-owned marshes included: (1) the prevention of level ditching or diking which would block flow of water across the marshes, and (2) the use of controlled burning and brush cutting to curtail plant succession on marshes where desirable grasses and sedges were being replaced by undesirable woody vegetation. (Auth.)

12939. Gould, William R., and C. J. D. Brown (Coop. Fish. Unit, Montana State Univ., Bozeman, Montana). 1970. DISTRIBUTIONS OF SCULPINS (COTTIDAE) IN MONTANA. Copeia No. 3, pp. 594-595.

12940. Sutterlin, A. M., and N. Sutterlin (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1970. TASTE RESPONSES IN ATLANTIC SALMON (Salmo salar) PARR. J. Fish. Res. Bd. Canada, 27(11): 1927-1942.

External receptors located in the snout region of Atlantic salmon parr are innervated by the facial nerve and are differentially sensitive to several chloride salts ($NaCl = KCl > MgCl_2 > CaCl_2$). They are also sensitive to mineral and organic acids but insensitive to uncharged molecules such as neutral amino acids and simple sugars. The palatine organ containing taste buds situated on the roof of the mouth is sensitive to strongly ionized as well as uncharged molecules. The two classes of receptors differ in temporal patterns of discharge and in their susceptibility to the blocking agents Hg^{++} and Pb^{++} and the potentiating agent Cu^{++}. Salmon parr can detect Hg^{++} in concentrations lower than other divalent cations as judged electrophysiologically; food pellets treated with dilute solutions of Hg^{++} are rejected by the fish. As chain length increases in the aliphatic acid series the compounds become increasingly stimulatory as measured by nerve discharges in the palatine nerve. Inert carriers treated with aliphatic acids of increasing chain length become increasingly preferred by salmon, and carriers treated with valeric and caproic acid are ingested. Anosmic fish are capable of discriminating chemically treated carriers in a way similar to fish in which the olfactory organ is intact. The cellular nature of external receptors of the snout is uncertain; the possibility that they are neuromasts is discussed. (Authors)

12941. Sekerak, A. D. (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1970. PARASITIC COPEPODS OF Sebastodes alutus INCLUDING Chondracanthus triventricosus SP. NOV. AND Colobomatus kyphosus SP. NOV. J. Fish. Res. Bd. Canada, 27(11): 1943-1960.

Sixty-six specimens of Sebastodes alutus, the Pacific ocean perch, collected from the coast of Oregon and British Columbia were examined for parasitic copepods. The six species identified are Chondracanthus pinguis Wilson, 1912, Chondracanthus triventricosus sp. nov., Clavella parva Wilson, 1912, Brachiella robusta (Wilson 1912) Kabata, 1970, Colobomatus kyphosus sp. nov., and Sarcotaces arcticus Collett 1874. Colobomatus kyphosus is the second species of the genus to be described from the eastern Pacific and Ch. triventricosus is the second chondracanthid to be found in nasal cavities. Sarcotaces arcticus is reported as a parasite of S. alutus for the first time. Details of the appendages of each new species are described and illustrated. (Auth.)

12942. Northcote, T. G., S. N. Williscroft, and H. Tsuyuki (Fish. Res. Bd. of Canada, Vancouver Lab., Vancouver, Brit. Columbia, Canada). 1970. MERISTIC AND LACTATE DEHYDROGENASE GENOTYPE DIFFERENCES IN STREAM POPULATIONS OF RAINBOW TROUT BELOW AND ABOVE A WATERFALL. J. Fish. Res. Bd. Canada, 27(11): 1987- 1995.

Rainbow trout (Salmo gairdneri) from above a waterfall on Kokanee Creek had significantly higher average number of parr marks and scale rows but lower number of vertebrae compared with those living below the falls. Three phenotypic forms of liver lactate dehydrogenase (LDH) were recognized in Kokanee Creek rainbow trout (two single-banded homozygous forms CC and C'C' and a five-banded heterozygous form CC'), apparently under the control of a two allele system. Homozygote CC was predominant in trout from the above falls population and homozygote C'C' was predominant in those from below the falls. Possible origins of meristic and LDH differences between above- and below-falls populations are discussed and their significance to differences in behaviour, particularly migratory, are considered. (Authors)

12943. Yurovitskii, Yu. G., and L. S. Mil'man. 1969. PECULIARITIES OF THE TRIOSE PHOSPHATE METABOLISM IN THE DEVELOPING LOACH EMBRYO. Doklady Biological Sciences, 184(1-6): 15-18.

12944. Manohar, S. V. (Fish. Res. Bd. of Canada, Freshwater Inst., Winnipeg, Manitoba, Canada). 1970. POSTMORTEM GLYCOLYTIC AND OTHER BIOCHEMICAL CHANGES IN WHITE MUSCLE OF WHITE SUCKER (Catostomus commersoni) AND NORTHERN PIKE (Esox lucius) AT 0 C. J. Fish.Res. Bd. Canada, 27(11): 1997-2002.

Postmortem biochemical changes in the white muscle of white sucker and of northern pike were, in general, similar to those observed in other species as reported previously by other investigators. However, glycogen content of pike was found to remain relatively high even after 7 days of storage in ice. This is in contrast to the findings with several other species, including white sucker, where the muscle glycogen is practically completely degraded in 3 - 4 days. Higher glycogen content in the posterior portion of pike muscle as compared with that in the anterior portion may partly explain the apparent high glycogen content in the muscle of this fish after several days of storage. (Auth.)

12945. Gardner, Linda J. (Fish. Res. Bd. of Canada, Vancouver Lab., Vancouver Brit. Columbia, Canada). 1970. 5'-NUCLEOTIDASE OF TESTES OF IMMATURE SOCKEYE SALMON (Oncorhynchus nerka). J. Fish. Res. Bd. Canada, 27(11): 2003-2007.

Fifty percent of the salmon 5'-nucleotidase is in the soluble fraction after high-speed centrifugation. A threefold purification on a Sephadex G-200 column gives a specific activity of 0.5 μmoles UMP hydrolyzed per hour per milligram of protein. The pH activity curve gives a single peak with an optimum at pH 9.0. $MgCl_2$, $CaCl_2$, and $MnSO_4$ increase the activity whereas Zn acetate, Ni acetate, and $CoSO_4$ inhibit the enzyme. EDTA, KF 2-mercaptoethanol, and dithiothreitol inhibit the nucleotidase activity. It is stable for up to 1 week at 0 C and up to 2 hr at 35 C, but activity decreases to 50% after 15 min at 50 C and no activity is left after 15 min at 60 C. The nucleotidase shows greatest activity towards 5'-nucleotides; 2'(3') nucleotides and 5'-deoxynucleotides are hydrolyzed less effectively. Ribose-5-phosphate and p-nitrophenylphosphate are hydrolyzed, but no activity is exhibited against fructose-1-phosphate and -glycerophosphate. (Auth.)

12946. Ennis, G. P. (Fish. Res. Bd. of Canada, Biol. Sta., St. John's, Newfoundland, Canada). 1970. REPRODUCTION AND ASSOCIATED BEHAVIOUR IN THE SHORTHORN SCULPIN, Myoxocephalus scorpius IN NEWFOUNDLAND WATERS. J. Fish. Res. Bd. Canada, 27(11): 2037-2045.

In Newfoundland waters, maturing ovaries of the shorthorn sculpin contain three generations of ova. Only the largest or ripe ova of the first generation are deposited at spawning time, which starts in late November or early December and lasts for about 1 month. It appears that only one male and one female participate in the spawning act and the eggs are laid in V-shaped crevices on rocky bottom at depths between 20 and 35 ft (6 and 11 m). The eggs adhere firmly to each other and the egg mass so formed adheres firmly to the bottom. After spawning, the spent females move from the spawning area to deeper water, but the males remain guarding the eggs until they hatch. At temperatures near 0 C embryonic development takes over 3 months to complete. Hatching starts around mid-March and lasts for 3 - 4 weeks. Newly hatched larvae occupy all layers of the water column over the spawning grounds but tend to concentrate near the bottom. Fecundity of mature females ranging in length from 20.1 to 50.5 cm ranges from 4205 to 60,976 eggs. (Auth.)

12947. Hogan, James W. (Fish-Pesticide Res. Lab., U. S. Bur. of Sport Fish. and Wildlife, Columbia, Missouri). 1970. WATER TEMPERATURE AS A SOURCE OF VARIATION IN SPECIFIC ACTIVITY OF BRAIN ACETYLCHOLINESTERASE OF BLUEGILLS. Bull. of Environmental Contamination & Toxicology, 5(4): 347-353.

Changes in ambient water temperature may be a source of considerable error in the use of bluegill brain AChE for the biological assessment of pollution by anticholinesterase agents. (From auth.)

12948. Edsall, Thomas A., Donald V. Rottiers, and Edward H. Brown (U. S. Bur. of Comm. Fish., Great Lakes Fishery Lab., Ann Arbor, Michigan). 1970. TEMPERATURE TOLERANCE OF BLOATER (Coregonus hoyi). J. Fish. Res. Bd. Canada, 27(11): 2047-2052.

Juvenile and young adult bloaters (Coregonus hoyi) were tested for tolerance to high temperatures. The ultimate upper lethal temperature of juvenile bloaters (26.75 C) appeared to be slightly higher than that of young adult bloaters, but was similar to that of juvenile ciscoes, Coregonus artedii (26.0 C), the only other North American coregonine for which a detailed description of temperature tolerance has been published. Regression equations are given that permit estimation of the thermal tolerance when the lethal temperatures are incompletely known. The estimated thermal tolerance of juvenile bloaters (617 units) was slightly less than that of the brook trout (Salvelinus fontinalis; 625 units), but was higher than that of other Salmonidae. (Authors)

12949. Cooper, Edwin L. (The Pennsylvania State Univ., University Park, Pennsylvania). 1970. GROWTH OF CUTTHROAT TROUT (Salmo clarki) IN CHEF CREEK, VANCOUVER ISLAND, BRITISH COLUMBIA. J. Fish. Res. Bd. Canada, 27(11): 2063-2070.

Cutthroat trout were collected periodically from April 3 to September 20, 1968, by electrofishing and were preserved in formalin. Within a few days, each fish was measured and a sample of scales was taken for study. Scales first appeared on these cutthroat trout immediately above and below the lateral line on the anterior portion of the caudal peduncle. Scales were always selected from this area for study, mounted in glycerin-gelatin, and examined at a magnification of 127 diameters. Scales grow relatively more slowly as the fish increases in length, causing the body-scale relation to be curvilinear. Growth of the fish was determined both by calculating size-at-age data from the scales and by comparing mean lengths of age-groups collected at different times of the year. The growth of cutthroat trout from Chef Creek was slow; calculated mean fork lengths for the first three annuli were 50, 84, and 119 mm. Only a few fish of age-group IV were collected and these were considered to be nonanadromous individuals on the basis of scale examination and small size. (Auth.)

12950. Yuen, Heeny S. H. (National Marine Fish. Serv., Honolulu Lab., Honolulu, Hawaii). 1970. BEHAVIOR OF SKIPJACK TUNA, Katsuwonus pelamis, AS DETERMINED BY TRACKING WITH ULTRASONIC DEVICES. J. Fish. Res. Bd. Canada, 27(11): 2071-2079.

A 50-kHz transmitter was placed in the stomach of a 44-cm (estimated) skipjack tuna, Katsuwonus pelamis, at Kaula Bank, Hawaii. With a few interruptions the fish was tracked from August 30 to September 6, 1969. The fish made nightly journeys of 25 - 106 km away from the bank and, with one exception, returned to the bank every morning to remain there for the day. Another skipjack tuna, about 40 cm long, was tracked for 12 hr at Penguin Bank, Hawaii. It also stayed at the bank during the day and left at night. Both fish swam close to the surface at night but swam at various depths during the day. The repeated morning returns of the skipjack tuna to Kaula Bank imply that skipjack tuna can navigate and that they have a sense of time. (Auth.)

12951. Parsons, L. S., and V. M. Hodder (Fish. Res. Bd. of Canada, Biol. Sta., St. John's, Newfoundland, Canada). 1970. OCCURRENCE OF JUVENILE AND SPAWNING ATLANTIC MACKEREL IN SOUTHEASTERN NEWFOUNDLAND COASTAL WATERS. J. Fish. Res. Bd. Canada, 27(11): 2097-2100.

The capture of juvenile mackerel in Conception Bay, Nfld., during November 1968 represents the first documented record of the occurrence of 0-group mackerel in eastern Newfoundland waters. Their presence suggested the possibility of sporadic mackerel spawning in the area. This was confirmed by the capture of prespawning and spawning mackerel in Placentia Bay during early July 1970. (Authors)

12952. Gray, R. W., and J. A. McKenzie (Dept. of Biology, Univ. of New Brunswick, Fredericton, New Brunswick, Canada). 1970. MUSCLE PROTEIN ELECTROPHORESIS IN THE GENUS Salmo OF EASTERN CANADA. J. Fish. Res. Bd. Canada, 27(11): 2109-2112.

The muscle protein pattern of Atlantic salmon (Salmo salar L.) examined differed markedly from that of brown trout (Salmo trutta L.) and rainbow trout (Salmo gairdneri Richardson). Atlantic salmon muscle proteins from six areas were not influenced by the differences in sex, stage of maturation, or geographical location. The muscle proteins of brown trout taken from two areas in Newfoundland were similar and could not be easily distinguished from that of rainbow trout from Newfoundland. A polymorphism was observed in the pattern of rainbow trout from Great Pond, Nfld. The consistency of the patterns within species suggests that they may provide useful characters for identification purposes. (Authors)

12953. Janicki, Ralph, and Jo Lingis (Cell. and Rad. Biol. Labs., Allegheny Gen. Hospital, Pittsburgh, Pennsylvania). 1970. MECHANISM OF AMMONIA PRODUCTION FROM ASPARTATE IN TELEOST LIVER. Comp. Biochem. Physiol., 37(1): 101-105.

Ammonia production from L-aspartate was studied in liver homogenates from four species of teleosts: Myoxocephalus scorpius, M. octodecimspinosus, Pseudopleuronectes americanus and Anguilla rostrata. Liver homogenates from two species of elasmobranchs, Squalus acanthias and Raja erinacea, failed to liberate ammonia from L-aspartate. No ammonia was liberated from L-aspartate in liver homogenates from M. scorpius in the presence of transaminase inhibitors: 4×10^{-3} M semicarbizide, 5×10^{-3} M isonicotinoyl hydrazide and 4×10^{-3} M hydroxylamine. Single subcellular fractions, nuclear, mitochondrial and cytoplasmic, failed to produce ammonia from L-aspartate. However, when mitochondrial and cytoplasmic fractions were combined, ammonia was produced from L-aspartate. The results indicated a transamination reaction is involved in the liberation of ammonia from L-aspartate in teleost liver. (Authors)

12954. Natochin, Yu. V., and G. P. Gusev (Inst. of Evol. Physiol. and Biochem., AS USSR, Leningrad, USSR). 1970. THE COUPLING OF MAGNESIUM SECRETION AND SODIUM REABSORPTION IN THE KIDNEY OF TELEOST. Comp. Biochem. Physiol., 37(1): 107-111.

There is a negative correlation between the bladder urine concentration of Na and Mg in the scorpion fish. Mg excretion and Na reabsorption are sharply increased after intramuscular injection of $MgCl_2$ solution to migrating juvenile salmonids and horse mackerel. A close positive correlation is observed between the amount of the reabsorbed Na ions and that of the secreted Mg ions. After inhibition of Na reabsorption by Brinaldix or Lasix, Mg secretion decreased. The data obtained indicate an important role for Na reabsorption in Mg secretion in fish kidney. (Authors)

12955. Mehrle, Paul M., and W. R. Fleming (Fish-Pesticide Res. Lab., Bur. Sport Fisheries and Wildlife, Columbia, Missouri). 1970. THE EFFECT OF EARLY AND MIDDAY PROLACTIN INJECTION ON THE LIPID CONTENT OF Fundulus kansae HELD ON A CONSTANT PHOTOPERIOD. Comp. Biochem. Physiol., 36(3): 597-603.

Ovine prolactin caused different effects upon the lipid content of the euryhaline teleost, Fundulus kansae, depending upon the time of injection. Prolactin administered in the early hours of a 16-hr photoperiod caused a 19 percent decrease in total body lipid, when administered during the middle of the photoperiod, total body lipid increased 22 percent. The affected lipids were primarily even-numbered, long-chain fatty acids in the C-14 to C-24 range. Results with hypophysectomized animals were similar, with a 13 percent decrease in lipid noted after prolactin injections given early in the photoperiod, and a 13 percent increase in lipid after midday injections. (Authors)

12956. Mizelle, J. D., and H. D. McDougal (Sacramento State Coll., Sacramento, California). 1970. STUDIES ON MONOGENETIC TREMATODES. XLV. THE GENUS Dactylogyrus IN NORTH AMERICA. KEY TO SPECIES, HOST-PARASITE AND PARASITE-HOST LISTS, LOCALITIES, EMENDATIONS, AND DESCRIPTIONS OF D. kritskyi sp. n. Amer. Midl. Nat., 84(2): 444-462.

A key, a host-parasite list, and a parasite-host list with localities are given for the 97 species of Gyrodactylus reported from North America. The genus Dactylogyrus and the subfamily Dactylogyrinae are emended and D. kritskyi sp. n. is described. (Authors)

12957. Kleerekoper, H., A. M. Timms, G. F. Westlake, F. B. Davy, T. Malar, and V. M. Anderson (Inst. of Life Science, Texas A & M Univ., College Station, Texas). 1970. AN ANALYSIS OF LOCOMOTOR BEHAVIOUR OF GOLDFISH (Carassius auratus). Anim. Behav., 18(2): 317-330.

The movements of individually observed naive goldfish, 25 to 30 cm long, in a novel 'open field' consisting of a tank measuring 5.0 x 5.0 x 0.5 m in constant environmental conditions, were continuously monitored during periods from 11 to 69 hr. The size, direction, and sequence of turns, length of steps, and velocities were computed, and their relationships analysed by a computer and data-processing system on line. Locomotor patterns were plotted and the effects of time (decrease in novelty content) assessed in the light of available data on these parameters in other species. It was concluded that spontaneous alternation may be related to orientation but not to exploratory behavior. (Authors)

12958. Harrises, Antonio E., and Robert L. Vickery (Univ. of Southern Mississippi, Southern Station, Hattiesburg, Mississippi). 1970. ADDITIONAL SPECIES OF ANCYROCEPHALINAE (TREMATODA: MONOGENEA) FROM DARTERS OF SOUTHERN MISSISSIPPI. Amer. Midl. Nat., 84(2): 437-443.

Four new species of Ancyrocephalinae are described from darters (Percidae: Etheostomatinae) from Mississippi: Urocleidus ammocryptus from Ammocrypta beani Jordan, and Etheostoma parvipinne Gilbert and Swain; U. chlorosomus and U. lottensis from Etheostoma chlorosomum (Hay); and U. stigmaeus and U. chlorosomus from Etheostoma stigmaeum (Jordan). U. nigrofasciatus Harrises, 1962, from a new host locality is included. (Authors)

12959. Hafeez, M. A. (Dept. of Zoology, Univ. of California, Berkeley, California). 1970. EFFECT OF MELATONIN ON BODY COLORATION AND SPONTANEOUS SWIMMING ACTIVITY IN RAINBOW TROUT, Salmo gairdneri. Comp. Biochem. Physiol., 36(4): 639-656.

Melatonin causes body blanching in rainbow trout (Salmo gairdneri) and the response is dose-dependent. A significant change in coloration was evoked by doses as low as 0.007 μg/g (intraperitoneal) and 2 μg/ml (in ambient water). Evidence is presented that melatonin given in ambient water affects coloration both through uptake in the blood as well as via possible diffusion through the skin. In spite of the apparently pharmacological nature of dose levels, the feasibility of a biological role in melatonin is evaluated. Melatonin induced a dose-dependent impairment of body movements and equilibrium indicating that is has neural effects. The relative time course of impairment and blanching responses supports the view that the regulation of coloration may be mediated by action of melatonin primarily on peripheral sites. Observations on blinded trout (with or without pineal) and the results of background reversal experiments indicate possible involvement of a melanophore-stimulating hormone. The possibility of an interaction of melatonin with this hormone and/or direct effect at the sympathetic terminal-melanophore level is considered. Pinealectomy in trout with eyes intact had no effect either on responses to melatonin or on swimming activity. However, melatonin led to a significant inhibition of the latter. It was not possible to differentiate between the toxic effect and possibly specific effect of melatonin on swimming activity. The significance of the present observations in relation to pineal function is also discussed. (Auth.)

12960. Atherton, W. D., and A. Aitken (Zoology Dept., Nottingham University, England). 1970. GROWTH, NITROGEN METABOLISM AND FAT METABOLISM IN Salmo gairdneri, Rich. Comp. Biochem. Physiol., 36(4): 719-747.

Studies of growth and nitrogen balance were made on individual fish. The effects of temperature and diet change were investigated. Feeding a low fat content diet tended to confirm the finding of other workers that 12°C is approximately the optimum temperature for trout growth. 12°C is a compromise between efficient absorption in the gut and high energy demands at 16°C, and an inefficient absorption and low energy demands at 8°C. Feeding high fat content diets resulted in fish at 16°C showing greater growth rates than those kept at 12°C. Accompanying this, there was a greater reduction in ammonia excretion and a higher proportion of ingested nitrogen was retained for growth. With temperature rise, a greater percentage of ingested fat was absorbed by the fish. In these diets, fat replaces nitrogenous compounds as an energy source, and increasingly so with rise in temperature. (Authors)

12961. Johnson, Allyn G., Fred M. Utter, and Harold O. Hodgins (U. S. Bur. Commercial Fisheries, Biol. Lab., Seattle, Washington). 1970. INTERSPECIFIC VARIATION OF TETRAZOLIUM OXIDASE IN Sebastodes (ROCKFISH). Comp. Biochem. Physiol., 37(2): 281-285.

Fifteen species of Sebastodes were separated into three groups on the basis of mobility of tetrazolium oxidase in starch gels. An apparent relation was observed between tetrazolium oxidase mobility and spawning season. (Authors)

12962. Saether, Ole A. (Fish. Res. Bd. of Canada, Freshwater Inst., Winnipeg, Manitoba, Canada). 1970. NEARCTIC AND PALAEARCTIC Chaoborus (DIPTERA: CHAOBORIDAE). Bull. Fish. Res. Bd. Canada No. 174, 57 p.

New descriptions, redescriptions, supplementary descriptions, taxonomical comments, and new distribution records are given for the 14 known Nearctic and Palaearctic species of Chaoborus. One new subgenus, Peusomyia, is erected for the species Chaoborus pallidus (Fabr.). Two new species are described: Chaoborus (Schadanophasma) brunskilli and Chaoborus (Schadanophasma) cooki. Two other species, Chaoborus (Schadanophasma) nyblaei (Zett.) and Chaoborus (Schadanophasma) frivittatus (Loew), are redefined. One new synonym is given: Chaoborus (Chaoborus) crystallinus (De Geer) (syn. Chaoborus borealis Cook). Chaoborus (Chaoborus) americanus (Joh.) is divided into two forms, C. americanus f. typica f. nov. and C. americanus f. sonjai f. nov. The phylogeny of the genera of the Chaoboridae and of the species of Chaoborus is discussed. Thirty-six phylogenetic trends have been deduced from characters found in the adults, 10 from characters found in the pupae, and 22 from characters in the larvae. Many of these trends are found as parallelisms within different genera and even subgenera. The evolutionary level, indicated by the "Evolution Index" of Illies, is calculated for the species of Chaoborus. An adjusted evolution index giving each trend equal value regardless of number of steps also is calculated. The interrelationships of the Chaoboridae in general and of the species of Chaoborus, are elaborated by means of the trends and represented in a synapomorphic diagram. The tribe Chaoborini seems an apomorphic sister group of the more plesiomorphic tribe Cryophilini. These two tribes together probably are the sister group of the tribe Mochlonyxini and all three tribes together constitute the subfamily Chaoborinae. (Auth.)

12963. Burmakin, E. V. (Lab. of Acclimatization GosNIORKh, USSR). 1967. ON INVESTIGATIONS OF THE FISHERY TRANSFORMATION OF LAKES BY THE CHEMICAL METHOD. (Ob issledovaniyakh rybokhozyaistvennogo preobrazovaniya ozer khimicheskim metodom). Izvestiya Gosudarstvennogo Nauchno-issledovatel'skogo Instituta Ozernogo i Rechnogo Rybnogo Khozyaistva, Vol. 64, pp. 5-17. Translated from the Russian by Robert M. Howland.

Problems in the treatment of lakes with piscicides are discussed. A list of publications (through 1965) is presented dealing with development of the chemical method based on the use of PCP (polychlorpinene), and also with the results and perspectives of its application.

12964. Loukashkin, Anatole S. (Calif. Academy of Sciences, San Francisco, California). 1970. ON THE DIET AND FEEDING BEHAVIOR OF THE NORTHERN ANCHOVY, Engraulis mordax (Girard). Proc. Calif. Acad. Sci., Fourth series, Vol. 37(13): 419-458.

The northern anchovy, Engraulis mordax Girard, is a planktophagous species. It is an omnivorous animal living either on phytoplanktonic or zooplanktonic organisms, or on both at the same time. Zooplankters seem to be preferred in the anchovy diet. Among zooplankters, crustaceans in all stages, from egg to adult form, appear to be the most dominant food objects found in the stomach contents. Of crustaceans, the copepods and euphausiids are most frequently and abundantly found in the stomachs, and they appear to be the most important food items in the diet of the northern anchovy, as well as in the diet of other anchovies whose food habits were already reported by other investigators. Though phytoplanktonic organisms were also found in the stomachs (sometimes they constituted a dominating item, or they even contributed up to 100 percent of the contents), their role in the anchovy diet seems on the whole negligible. In mode of feeding, the northern anchovy is primarily a filter feeder, but may also be a particulate or selective feeder, depending on the size of the available food. In relation to feeding habits, the northern anchovy is a diurnal animal, feeding mostly during the day. From the larval stages through adult life, the northern anchovy shows an apparent preference for the second link in the food chain. This is in contrast to the food of the Peruvian anchoveta, Engraulis ringens, which is reported to be chiefly phytoplankton. (From auth. conclusions)

12965. Rogers, Wilmer A. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1967. SIX NEW SPECIES OF Gyrodactylus (MONOGENEA) FROM THE SOUTHEASTERN U. S. J. Parasit., 53(4): 747-751.

Six new species of Gyrodactylus are described from fishes of the southeastern U. S. as follows: G. asperus sp. n. from Notropis baileyi Suttkus and Raney, G. ictaluri sp. n. from Ictalurus punctatus (Raf.), G. lacustricolae sp. n. from Erimyzon sucetta (Lacepede), G. lambanus sp. n. from Notropis longirostris (Hay), G. nataliae sp. n. from Hybopsis amblops (Raf.), and G. trematoclithrus sp. n. from Lucania goodei Jordan. Fish hosts were collected from Alabama, Florida, Georgia, and South Carolina. Type specimens were deposited in the USNM Helm. Collection, Beltsville, Maryland. (Auth.)

12966. Smith, W. G., and Michael P. Fahay (Sandy Hook Marine Lab., Highlands, New Jersey). 1970. DESCRIPTION OF EGGS AND LARVAE OF THE SUMMER FLOUNDER, Paralichthys dentatus. U. S. Dept. of the Interior, Bur. of Sport Fisheries and Wildlife Research Report No. 75, 21 p. illus.

Summer flounder eggs and larvae are described from artificially fertilized specimens and from material collected at sea. Diameter of the pelagic egg ranges from 0.90 to 1.10 mm with a mean of 1.02 mm. Diameter of the single oil globule ranges from 0.18 to 0.31 mm with a mean of 0.25 mm. At hatching, the larva lacks eye pigment, fin buds, and mouth parts. The posterior quarter of the larva is unpigmented. The body begins to flatten laterally at about 7.5 mm. The right eye begins migrating to the left side of the skull and the urostyle tips up at about 9.5 mm. Median fin rays are largely formed between 9.0 and 10.0 mm with anal fin rays appearing last. Median fin ray counts fall within the adult range of 13.0 mm. A significant difference is noted in pigmentation and development with size between specimens examined and those described as Paralichthys sp. by Hildebrand and Cable (1931). (Authors)

12967. Allen, K. Radway (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1967. SOME QUICK METHODS FOR ESTIMATING THE EFFECT ON CATCH OF CHANGES IN THE SIZE LIMIT. J. Cons., 31(1): 111-126; 1968 Studies Fish. Res. Bd. Canada, Part 2, FRB Studies No. 1235, pp. 1-16.

This paper proposes methods of estimating the increase in catch which will be ultimately obtained if the size limit is raised to the correct value from an existing level which is too low, if it is assumed that the proportion ultimately caught remains constant. (From auth.)

12968. Lachner, Ernest A., C. Richard Robins, and Walter R. Courtenay, Jr. 1970. EXOTIC FISHES AND OTHER AQUATIC ORGANISMS INTRODUCED INTO NORTH AMERICA. Smithsonian Contributions to Zoology, 59: 1-29. Supt. of Documents, U. S. Govt. Printing Office, Wash., D. C., 45 cents (paper cover).

The introduction of aquatic animals from foreign lands to the waters of the United States is not a new problem, but it is rapidly accelerating, particularly because of the increase in quantity and in kinds of fishes entering the aquarium trade. The introduction of each fish species that is judged to be established is reviewed with respect to place of origin, mode of transport, area of release, and rationale. Transplants of native fishes from one drainage to another or from one end of the country to the other, though often resulting in harm to local faunas are only reviewed in a cursory manner. Twenty-five species of exotic fishes are now established in waters of the United States exclusive of Hawaii. They include one trout (Salmonidae), six minnows (Cyprinidae), one loach (Cobitidae), one catfish (Clariidae), five livebearers (Poeciliidae), two drums (Sciaenidae), seven cichlids (Cichlidae), and two gobies (Gobiidae). Except for the gobies and drums, all are freshwater species. Many other exotic species have been caught in our waters, but their establishment is not yet demonstrated. The areas affected vary considerably, from local warm springs, in which the exotic species probably could be eliminated, to large and interconnected systems in which no amount of money or effort could remove the introduced animal. Introductions have been both purposeful and accidental. Though sometimes well intentioned, they have never been preceded by a thorough study of the possible effect of the species in question on the local biota. Where purposeful, introductions have usually involved a single organization which has acted on the basis of its own limited interests. Particular attention is given to Florida and Hawaii, the states most affected by introductions. They differ markedly in the nature of the problem since in Hawaii freshwater drainages are isolated and small, whereas Florida's fresh waters are extensive and interconnected by canals. Most of the 64 million fishes imported into the United States each year enter through southeastern ports, especially Miami and Tampa. The growth of the aquarium industry in Florida, and careless management of its holding tanks or ponds, has resulted in the introduction and establishment of species that serve no useful purpose and can only offer competition with native fishes. Brief consideration is given to aquatic plants and invertebrates, both groups of which have created major and expensive control problems. Although the problems raised by aquatic animals already introduced into our waters are serious, they threaten to become much worse if meaningful control and regulation of imported animals is not quickly forthcoming. The biological pathway involved in the role of introductions is their establishment through reproduction, and their competition with, and, in some cases, extinction of native fauna. Recommendations are made to assist the control of introductions, and the resolutions of a recent conference on this subject are repeated. (Authors)

12969. Marking, Leif L. (Bur. of Sport Fish. and Wildl., Fish Control Lab., La Crosse, Wisconsin). 1970. A METHOD FOR RATING CHEMICALS FOR POTENCY AGAINST FISH AND OTHER ORGANISMS. U. S. Dept. of the Interior, Bur. of Sport Fish. & Wildl. Investigations in Fish Control No. 36, pp. 3-8.

A potency rating is presented by which the toxicity of chemicals to organisms can be assessed with a minimum of data from preliminary bioassays. This method permits effective and rapid evaluation of toxicity when data from preliminary tests are inadequate for statistical analysis. In bioassays of chemicals against fish, the mortality is recorded in 3- to 96-hour tests when exposed to three concentrations. The potency rating of a bioassayed chemical, when compared with the maximum value on the rating scale, indicates the relative toxicity of the chemical. Concentrations and exposure times can be changed to fit a specific bioassay program. Results of 24- or 48-hour bioassays can be compared with 96-hour bioassays because the maximum values of the rating scales are approximately equal at all time intervals. The potency rating is more applicable to toxicants which have similar dose-effect curves. (Auth.)

12970. Marking, Leif L., and Wayne A. Willford (Bur. of Sport Fisheries and Wildlife, Fish Control Lab., La Crosse, Wisconsin). 1970. COMPARATIVE TOXICITY OF 29 NITROSALICYLANILIDES AND RELATED COMPOUNDS TO EIGHT SPECIES OF FISH. U. S. Dept. of the Interior, Bur. of Sport Fish. & Wildl. Investigations in Fish Control No. 37, pp. 3-11.

The relative potencies of 29 nitrosalicylanilides and related structures against rainbow trout, goldfish, carp, fathead minnows, black bullheads, green sunfish, bluegills, and yellow perch were determined in 96-hour static bioassays. They varied from zero to the maximum potency of the system, depending on the type and position of substitutions. The 4'-substitutions on 3-nitrosalicylanilide are essential in producing high toxicity and selectivity to fish. The toxic activity of nitrosalicylanilides increases as halogen substitutions are shifted from the 2' to the 3' and to the 4' positions on the aniline moiety. Activity increases as molecular weight of the substituent increases. 4'-azophenyl-3-nitrosalicylanilide and 4'-iodo-3-nitrosalicylanilide are more toxic than 4'-bromo- or 4'chloro-3-nitrosalicylanilide. The dihalo-substituted 3-nitrosalicylanilides are more toxic than monohalo-substituted 3-nitrosalicylanilides provided one of the halo-substitutions is at the 4'- position on the aniline moiety. 4'-bromo-3-nitrosalicylanilide is more toxic to carp, fathead minnows, bluegills, and yellow perch than to rainbow trout. Several compounds are selective to yellow perch. Goldfish are the most resistant species to the salicylanilides. (Authors)

12971. Marking, Leif L., Everett L. King, Charles R. Walker, and John H. Howell (Bur. of Sport Fish. and Wildl., Fish Control Lab., La Crosse, Wisconsin). 1970. TOXICITY OF 33NCS (3'-CHLORO-3-NITROSALICYLANILIDE) TO FRESHWATER FISH AND SEA LAMPREY. U. S. Dept. of the Interior, Bur. of Sport Fish. & Wildl. Investigations in Fish Control No. 38, pp. 3-16.

The chemical 33NCS (3'-chloro-3-nitrosalicylanilide) was evaluated as a fish control agent and as a larvicide for sea lampreys at the Fish Control Laboratories of the Bureau of Sport Fisheries and Wildlife and the Hammond Bay Biological Station of the Bureau of Commercial Fisheries. The chemical is rapidly toxic to many species. Sea lampreys, bowfin, and channel catfish are the most sensitive species. Carp are more sensitive than trouts or sunfishes. Use of 33NCS in selective control of freshwater fishes or sea lampreys requires precise control because its toxicity is strongly influenced by variations in water quality. (Authors)

12972. Sprague, John B., and Donald E. Drury (Fish. Res. Bd. of Canada, St. Andrews, New Brunswick, Canada). 1969. AVOIDANCE REACTIONS OF SALMONID FISH TO REPRESENTATIVE POLLUTANTS. Proc. 4th International Conf. of Water Poll. Res., Prague, Czechoslovakia, April 1969; London Pergamon Press, Ltd., pp. 169-179; Selected Water Resources Abstracts, 3(21): p. 20, 1970.

Studies to determine whether there is a general pattern of spontaneous avoidance reactions by fish to pollutants are described. The laboratory findings are related to field situations to predict behavior of fish if their natural habitat were affected by these pollutants. Rainbow trout and Atlantic salmon were subjected to clean water and to various sublethal concentrations of ABS detergent, phenol, chlorine and pulp mill effluent. Graphs show the percent of time the fish avoided or preferred solutions of clean water and different concentrations of the pollutants.

12973. U. S. Dept. of the Interior, Bureau of Sport Fisheries and Wildlife. 1970. PROSPECTUS FOR GREAT LAKES SPORT FISHERY RESEARCH. Bur. of Sport Fisheries and Wildlife, 41 p., illus.

12974. Shatunovskii, M. I. 1969. COMPARATIVE STUDY OF BLOOD SERUM LIPIDS OF COD, NAVAGA, FLUKE, AND ARCTIC FLOUNDER OF THE WHITE SEA. Doklady Biological Sciences, 184(1-6): 12-14.

12975. Singh, S. B., S. C. Banerjee, and P. C. Chakrabarti (Fish. Res. Sta., Cuttack, India). 1967. PRELIMINARY OBSERVATIONS ON RESPONSE OF YOUNG ONES OF CHINESE CARPS TO VARIOUS PHYSICO-CHEMICAL FACTORS OF WATER. Proc. of the National Acad. of Sci., India, 37(B): No. 111, pp. 320-324; Selected Water Resources Abstracts, 3(21): p. 21, 1970.

Chinese grass carp and silver carp are being introduced into various parts of India. Laboratory experiments were conducted to study the response and reaction of the young chinese and silver carps to wide fluctuations in water temperature, turbidity, pH, dissolved oxygen, total alkalinity, salinity, free ammonia, chlorine, and sulfide which may occur in the different habitats where the fish were introduced. Tolerance limits for both carp species to the water quality parameters are given. The authors concluded that the grass carp were able to withstand slightly greater fluctuations than were the silver carp. -- Sjolseth

12976. Allen, Kenneth O. (Louisiana State Univ., Baton Rouge, Louisiana). 1970. HEAT TOLERANCE OF ALBINO VS. NORMAL CHANNEL CATFISH Ictalurus punctatus. Proc. of the 22nd Ann. Conf. of Southeastern Assoc. of Game and Fish Commissioners, 1968, 1970, 4 p.; Selected Water Resources Abstracts, 3(21): p. 21, 1970.

Two lots of the Arkansas strain of channel catfish, Ictalurus punctatus, containing both albino and normal fish, were acclimated in the laboratory at a constant temperature of 30.0 deg C. Samples of albino and normal fish were exposed to a lethal temperature of 39.0 deg C. The albinos from both lots had the highest mean survival time, but the differences were not statistically significant. -- Sjolseth

12977. Sams, Roy E., and Kelly R. Conover (Oregon Fish Comm., Astoria, Oregon). 1969. WATER QUALITY AND MIGRATION OF FALL SALMON IN THE LOWER WILLAMETTE RIVER. Final Report, May, 1969, 58 p.; Selected Water Resources Abstracts, 3(21): p. 24, 1970.

Water quality and salmon migration data for the lower Willamette River were collected and analyzed to determine if water quality affected the migration of salmon. Some of the more important conclusions are: (1) Columbia River Coho salmon occur over a wide period of time, usually peaking in late October; (2) Chinook begin in early September; (3) Initial passage of chinook and coho over Willamette Falls was not preceded by a significant increase or decrease in streamflow; (4) At times low tides may have restricted passage over the falls; (5) 73 deg F water in the Willamette has not blocked fish from entering the river and (6) no salmon were observed passing over Willamette Falls until the D.O. level rose to 5 ppm or above. -- Sjolseth

12978. Coutant, Charles C. (Pacific Northwest Lab., Battelle-Northwest, Richland, Washington). 1969. TEMPERATURE, REPRODUCTION AND BEHAVIOR. Chesapeake Science, 10(3): 261-274; Selected Water Resources Abstracts, 3(21): p. 24, 1970.

Research being conducted on salmonid fishes at the Hanford nuclear complex on the Columbia River is discussed. Studies of thermal effects on reproduction and behavior include a 20-year, annual census of spawning chinook salmon near reactor discharges, laboratory experiments on incubation and rearing success at elevated temperatures, studies of equilibrium loss prior to thermal death at lethal temperatures, tests of relative predation rates upon thermally shocked and normal young salmonids, and tracking sonic tagged adults to determine migration behavior near thermal outfalls. -- Sjolseth

12979. Nikol'skaya, I. S., and N. S. Stepanova. 1969. EFFECT OF ANAEROBIOSIS ON CLEAVAGE AND ATP CONTENT OF LOACH EGGS. Doklady Biological Sciences, 185(1-6): 241-243.

12980. Wirth, Thomas L., Russell C. Dunst, Paul D. Uttormark, and William Hilsenhoff. 1970. MANIPULATION OF RESERVOIR WATERS FOR IMPROVED QUALITY AND FISH POPULATION RESPONSE. Dept. of Natural Resources, Madison, Wis. Research Report No. 62, 23 p.

Compressed air continuously mixed Cox Hollow lake, an 8-year-old eutrophic reservoir, for 3 years. Winter D.O. levels were greatly improved. The elimination of severe thermal stratification in summer resulted in: (1) considerable warming of deep water, (2) disappearance of high chemical concentrations near the bottom and recurrence of D.O., (3) habitation of profundal muds by invertebrates. There were no lasting improvements in water clarity or in several fish population parameters by the end of the study, although there was an increase in fish harvest. Eutrophication prevention by continual bottom-water discharge was studied in newly formed Twin Valley Lake. The hypolimnion was anaerobic during the summer resulting in high chemical concentrations. Large amounts of N and P were released, exceeding the potential amount for an epilimnion discharge; however, eutrophication was soon exemplified in high plankton densities and overabundant rooted vegetation. By the second fall the fish population exhibited signs of developing into a lower quality fishery. In the downstream channel warmer water in winter and colder water in summer benefited the growth and survival of stocked brown trout. Although the stream environment was still unsettled after three years, it was improved greatly. (Authors)

12981. Natovich, Yu. V., M. M. Sokolova, G. P. Gusev, E. I. Shakhmatova, and E. A. Lavrova. 1969. RELATIONSHIP BETWEEN SODIUM RESORPTION AND MAGNESIUM SECRETION IN THE SALMON KIDNEY. Doklady Biological Sciences, 186(1-6): 471-473.

12982. Luk'yanenko, V. I., and A. V. Popov. 1969. ALBUMEN COMPOSITION OF BLOOD SERUM IN TWO ALLOPATRIC POPULATIONS OF SIBERIA STURGEON Acipenser baeri Brandt. Doklady Biological Sciences, 186(1-6): 457-459.

12983. Rogers, Wilmer A. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1970. Epistylis (CILIATA: PERTRICHA) EPIZOOTICS OF FISH IN THE SOUTHEASTERN U. S. Annual meeting Southeastern Soc. of Parasitologists, April 2-4, 1970, Lakeland, Florida.

Cases of the stalked ciliated protozoan, Epistylis sp., causing a characteristic "red-sore" disease of fishes, have been reported to the Southeastern Cooperative Fish Disease Laboratory from virtually every state in the Southeastern U. S. Epizootics occur most frequently during the winter and spring months. Research has shown that this species is not an obligate parasite but only uses the host fish as an attachment site. The root-like attachment organelle, penetrating the skin of the fish, apparently secretes an enzyme that dissolves the fishes' scales and produces a pit-like inflamed sore. The ciliate also infests scaleless fishes (catfish). Bacterial infections often occur secondary to the Epistylis infestation. Although the disease is widespread, only a few cases are known where mortalities have occurred. Observations on the life history show a formation of telotrochs which are characteristic of the Peritricha. Preliminary laboratory tests show that a single treatment with potassium permanganate at a rate of 2 ppm or formalin at a rate of 15 ppm will control Epistylis. (Auth.)

12984. Yakovleva, I. V., and Z. K. Komachkova. 1969. THE NEUROHYPOPHYSIS AND THYROID GLAND OF ACIPENSERIDS IN WATER OF VARYING SALINITY. Doklady Biological Sciences, 186(1-6): 449-451.

12985. Garlov, P. E. 1969. ULTRASTRUCTURAL ORGANIZATION OF THE NEUROHYPOPHYSIS IN STURGEONS. Doklady Biological Sciences, 189(1-6): 863-866.

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12986. Buss, Keen, Delano R. Graff, and Edward R. Miller (Pennsylvania Fish Comm., Benner Spring Fish Res. Sta., Bellefonte, Pennsylvania). 1970. TROUT CULTURE IN VERTICAL UNITS. Progr. Fish Cult., 32(4): 187-191.

Research into the feasibility of trout culture in vertical units was begun after successfully holding rainbow trout (Salmo gairdneri) at very high densities in hatching jars. Tests were made in 1.66 gal hatching jars, 43 gal rearing drums, and a 5,450 gal silo. Production ranged from 7.7 lb in a hatching jar to 6,200 lb in the silo. Production per cubic foot was much higher in vertical units than in conventional units; however, the yield per gallon per minute was not particularly favorable. Because of the large volume of water needed, widespread application of this technique will be contingent upon development of efficient filtration and water reconditioning systems. (Authors)

12987. Summerville, Vernon C., and Henri D. Crawley (Arkansas Polytechnic Coll., Russellville, Arkansas). 1970. EGG PRODUCTION OF FLATHEAD CATFISH. Progr. Fish Cult., 32(4): p. 191.

Eggs from flathead catfish (Pylodictis olivaris) were preserved in 10% formalin, and their number was determined by sample counts and volumetric method. The mean number of eggs per fish was 13,250; the mean number per pound of fish, 1,600.

12988. Amend, Donald F. (Bur. of Sport Fish. and Wildl., Western Fish Disease Lab., Seattle, Washington). 1970. RETENTION OF MERCURY BY SALMON. Progr. Fish Cult., 32(4): 192-194.

Adult Pacific salmon (Oncorhynchus), which as juveniles received multiple exposures to mercurials, were analyzed for residual mercury when they returned from the sea. Fish that were not re-exposed to mercury upon entry to fresh water contained levels within the normal range (0-0.5 ppm). (Auth.)

12989. Murphy, J. P., and R. I. Lipper (Kansas State Univ., Manhattan, Kansas). 1970. BOD PRODUCTION OF CHANNEL CATFISH. Progr. Fish Cult., 32(4): 195-198.

Two mature channel catfish (Ictalurus punctatus) were hand-fed in a temperature-controlled tank with an accurately measured water dilution rate. Biochemical oxygen demand (BOD) of solid and soluble wastes was measured as well as DO, CO_2, NH_3, NO_3, and pH. On a per-pound live-weight basis, this BOD was about 50% greater than reported values for chickens and swine, five times the reported values for beef cattle. Pollution implications of intensive methods of catfish culture are discussed. (Authors)

12990. Wright, Sam, and Richard Kolb (Wash. Dept. of Fisheries, Olympia, Washington). 1970. A MICROFILM READER FOR FISH SCALE ANALYSIS. Progr. Fish Cult., 32(4): p. 198.

Methods of using a microfilm reader for scale analysis work with Pacific salmon (Oncorhynchus) are described. (Authors)

12991. Schoettger, Richard A., and Erwin W. Steucke, Jr. (Bur. of Sport Fish. and Wildl., Fish Control Lab., La Crosse, Wisconsin). 1970. QUINALDINE AND MS-222 AS SPAWNING AIDS FOR NORTHERN PIKE, MUSKELLUNGE, AND WALLEYES. Progr. Fish Cult., 32(4): 199-201.

The efficacy of quinaldine and MS-222 as spawning aids for northern pike (Esox lucius), muskellunge (E. masquinongy), and walleyes (Stizostedion vitreum) was documented under field conditions. Concentrations of 10 to 20 ppm of quinaldine, or 100 to 150 ppm of MS-222, were effective on the three species. Both anesthetics act rapidly. Quinaldine does not block reflex activity, but fish tolerate relatively long exposures. The reverse occurs in fish anesthetized with MS-222. (Authors)

12992. Schoettger, Richard A., and Erwin W. Steucke, Jr. (Bur. of Sport Fish. and Wildl., Fish Control Lab., La Crosse, Wisconsin). 1970. SYNERGIC MIXTURES OF MS-222 AND QUINALDINE AS ANESTHETICS FOR RAINBOW TROUT AND NORTHERN PIKE. Progr. Fish Cult., 32(4): 202-205.

Mixtures of MS-222 and quinaldine were tested against rainbow trout (Salmo gairdneri) and northern pike (Esox lucius) to determine if the combinations are more effective as anesthetics than either of the ingredients used independently. In the ranges of 20 to 60 ppm of MS-222 and 5 to 20 ppm of quinaldine, the mixtures are 3 to 5 times more effective on both species. Northern pike are about 2 to 3 times more resistant to the mixtures than rainbow trout. In the proper dosage, all reflex movement is blocked within 2 to 12 minutes, anesthesia can be maintained up to 1 hour, and the cost of chemical may be reduced 60% or more. (Authors)

12993. Heckman, J. Robert, and Paul E. Brubaker (Dept. of Biology, Elizabethtown College, Elizabethtown, Pennsylvania). 1970. CHROMOSOME PREPARATION FROM FISH BLOOD LEUKOCYTES. Progr. Fish Cult., 32(4): 206-208.

Fresh phytohemagglutinin (PHA) was used as the mitotic stimulator in preparing metaphase chromosome spreads from Carassius auratus (goldfish). (Authors)

12994. Larson, Gary (Dept. of Zoology, Univ. of Brit. Columbia, Vancouver, Brit. Columbia, Canada). 1970. A SIMPLE CHAMBER FOR SEPARATING BRINE SHRIMP NAUPLII FROM UNHATCHED EGGS AND EMPTY EGG CASES. Progr. Fish Cult., 32(4): p. 208.

An inexpensive wood box which separates large numbers of nauplii from unhatched eggs and empty egg cases has been designed.

12995. Hettler, William F., Jr. (Bur. of Comm. Fish., Biol. Lab., Beaufort, North Carolina). 1970. EFFECT OF PATERNAL DEATH ON SPERM VIABILITY IN THE ORANGETHROAT DARTER. Progr. Fish Cult., 32(4): 209-211.

Sperm in dead orangethroat darters, Etheostoma spectabile, remained viable for 3-1/2 hours at 15°C. The number of eggs fertilized decreased with delay in removing the sperm from the donor. Survival of the resulting larvae was not affected by the postmortem age of the sperm. Sperm from sympatric populations retained their potency longer than sperm from allopatric populations. Sperm removed at 1/2 hour intervals from 1 to 6 hours after death were nonmotile. These inactive sperm apparently were stimulated by the proximity of ova to complete fertilization. (Auth.)

12996. Fast, Arlo W. (Calif. Dept. of Fish and Game, Sacramento, California). 1970. AN EVALUATION OF THE EFFICIENCY OF ZOOBENTHOS SEPARATION BY SUGAR FLOTATION. Progr. Fish Cult., 32(4): 212-216.

Efficiency of zoobenthos separation by sugar flotation ranged from 1% for certain small organisms to 94% for certain large organisms. Median lengths of sorted oligochaetes and chironomid larvae were significantly different from unsorted lengths. (Auth.)

12997. Frame, David W., and Frederic M. Serchuk (Dept. of Forestry and Wildlife, Univ. of Mass., Amherst, Massachusetts). 1970. INEXPENSIVE REFERENCE SYSTEM FOR FISHERY BIOLOGISTS. Progr. Fish Cult., 32(4): p. 216.

A card index has been combined with the principles underlying the key-sort card system, allowing more latitude and flexibility than older methods. (Authors)

12998. Altukhov, Yu. P. 1969. RELATIONSHIP BETWEEN MONOMORPHISM AND POLYMORPHISM OF HEMOGLOBINS DURING MICROEVOLUTION OF FISHES. Doklady Biological Sciences, 189(1-6): 857-859.

12999. Hale, John G. (Fed. Wat. Poll. Contr. Admn., National Wat. Qual. Lab., Duluth, Minnesota). 1970. CULTURE OF LAKE HERRING IN THE LABORATORY. Progr. Fish Cult., 32(4): 217-221.

Lake herring (Coregonus artedii) eggs were successfully incubated and hatched at a mean temperature of 4.2°C and 3.9°C in two successive years. Five different diets were given fry over a 30-day period. Automatic feeding of live brine shrimp produced the largest fry and the lowest mortality over the 30-day period. Lake herring were successfully reared to 17 months by starting with live brine shrimp and transferring to commercial trout dry food. (Auth.)

13000. Hauser, William J. (Zool. Dept., Univ. of Maine, Orono, Maine). 1970. A RECORDING-MEASURING BOARD FOR FISH. Progr. Fish Cult., 32(4): p. 221.

Fish lengths are permanently recorded on a sheet of acetate by making a hole with a teasing needle at each fish length. Fish lengths are read later by placing the acetate over graph paper. Many fish can be processed by one individual under all field conditions. (Auth.)

13001. Verma, Mahendra N. (Fish. Lab., Gwalior, India). 1970. BREEDING OF MAJOR INDIAN CARPS IN A FOUNTAIN POND. Progr. Fish Cult., 32(4): 222-223.

Three pairs of ripe Labeo rohita and Cirrhina mrigala injected with pituitary freshly taken from gravid fish and 1 pair of uninjected, ripe L. rohita were released into a fountain pond. The injected pairs responded to the stimulus after an hour and bred; the uninjected pair bred only after the injected ones were spent.

13002. Howard, H. C., and Robert E. Thomas (Nebr. Game and Parks Comm., Lincoln, Nebraska). 1970. BEHAVIOR OF NORTHERN PIKE FRY AS RELATED TO POND CULTURE. Progr. Fish Cult., 32(4): 224-226.

Northern pike (Esox lucius) fry are very active for a short period immediately after hatching. During this period it is normal behavior for the fry to attach to some object. During a 3-year period, this hatchery recorded increased production from ponds stocked with eyed eggs or a combination of eyed eggs and newly hatched fry, as opposed to ponds stocked with 1- to 3-day old fry. Success with this method of stocking requires the presence of flooded vegetation to which newly hatched fry can attach during the critical period between hatching and swim-up. (Authors)

13003. Wahtola, C. H., Jr., and John B. Owen (Dept. of Biology, Univ. of No. Dakota, Grand Forks, North Dakota). 1970. A DECALCIFICATION TECHNIQUE FOR SECTIONING PECTORAL SPINES. Progr. Fish Cult., 32(4): p. 226.

Pectoral spines of black bullheads (Ictalurus melas) were softened in 5% HCL, held between two half-cylinders of pith, and sectioned with a razor blade. (Authors)

13004. Allen, Kenneth O., and James W. Avault, Jr. (School of Forestry and Wildlife Management, Louisiana State Univ., Baton Rouge, Louisiana). 1970. EFFECTS OF BRACKISH WATER ON ICHTHYOPHTHIRIASIS OF CHANNEL CATFISH. Progr. Fish Cult., 32(4): 227-230.

Brackish water controlled Ichthyophthirius multifilis on channel catfish (Ictalurus punctatus) in aquaria. Free-living stages were eliminated at salinities of 1 ppt or greater. Potential effects of brackish water on other parasites of freshwater fish are discussed. (Authors)

13005. Conrad, John F., and Ellis J. Wyatt (Fish Comm. of Oregon, Clackamas, Oregon). 1970. CONTROL OF Ichthyophthirius IN RECTANGULAR CIRCULATING PONDS. Progr. Fish Cult., 32(4): p. 235.

Formalin is used to control Ichthyophthirius in rectangular circulating ponds. Effectiveness of this control can be enhanced by conversion to 2 race-way-type ponds.

13006. Hunsaker, Don, Leo F. Marnell, and F. Phillip Sharpe (San Diego State Coll., San Diego, California). 1970. HOOKING MORTALITY OF YELLOWSTONE CUTTHROAT TROUT. Progr. Fish Cult., 32(4): 231-235.

Post-release hooking mortality caused by various types of fishing lures was determined for Yellowstone cutthroat trout (Salmo clarki lewisi). Mortality caused by barbed and barbless flies, and barbed and barbless treble hook lures (single-spoon type) was negligible. Trolling with a single hook baited with worm caused a significant loss. About half of all trout caught by the latter method took the hook inside the mouth, in the esophagus, gill arches, tongue, or roof of the mouth. Such hookings resulted in losses ranging from 64% to 84%. Superficial hooking with the single hook and worm had a mortality of 8.2%. Mortality increased slightly at higher water temperatures. (Authors)

13007. Johnson, F. Allen (Bur. of Sport Fish. and Wildl., Montpelier, Vermont). 1970. A DEVICE FOR FISH RECOVERY DURING TURBINE-PASSAGE MORTALITY STUDIES. Progr. Fish Cult., 32(4): 236-239.

Styrofoam eggs were tried as flotation devices to recover turbine-passed fish. The recovery rate was considered complete enough to determine the potential mortality to downstream migrant salmon stocks. The technique described should be applicable to turbine-passage studies at most generating plants. (Auth.)

13008. Allen, Donald M., and J. Harold Hudson (Bur. of Comm. Fish., Tropical Atlantic Biol. Lab., Miami, Florida). 1970. A SLED-MOUNTED SUCTION SAMPLER FOR BENTHIC ORGANISMS. U. S. Fish Wildl. Serv. Spec. Sci. Rep. Fish. No. 614, 5 p., illus.

The sampler is an underwater vacuum device mounted on a sled; a venturi-type water dredge provides suction. This equipment collects quantitative samples of young pink shrimp, Penaeus duorarum duorarum, and is effective in capturing other small benthic organisms. (Authors)

13009. U. S. Dept. of the Interior, Bur. of Comm. Fisheries. 1970. PROGRESS REPORT OF THE BUREAU OF COMMERCIAL FISHERIES CENTER FOR ESTUARINE AND MENHADEN RESEARCH, PESTICIDE FIELD STATION, GULF BREEZE, FLA., FISCAL YEAR 1969. U. S. Fish Wildl. Serv. Circ. No. 335, 33p., illus.

Research activities include studies on the fate and effect of pesticides in the estuarine environment.

13010. U. S. Dept. of the Interior, Bur. of Comm. Fisheries. 1970. REPORT OF THE BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY, BEAUFORT, N. C. FOR THE FISCAL YEAR ENDING JUNE 30, 1968. U. S. Fish Wildl. Serv. Circ. No. 341, 24 p., illus.

Results of biological research in the blue crab and menhaden programs are discussed. Major topics include abundance, distribution, and survival of blue crab and menhaden larvae, juveniles, and adults; results of menhaden tagging studies; and details of the 1967 menhaden fishery. Other activities of the laboratory staff, and publications for fiscal year 1968, are listed.

13011. Brown, George W., and James T. Krygier (Oregon State Univ., Corvallis, Oregon). 1970. EFFECTS OF CLEAR-CUTTING ON STREAM TEMPERATURE. Water Resources Research, 6(4): 1133-1139.

The principal source of energy for warming streams is the sun. The amount of sunlight reaching the stream may be increased after clear-cut logging. Average monthly maximum temperatures increased by 14°F and annual maximum temperatures increased from 57° to 85°F one year after clear-cut logging on a small watershed in Oregon's coast range. In a nearby watershed where strips of brush and trees separated logging units from the stream, no changes in temperature were observed that could be attributed to clear-cutting. (Authors)

13012. Sprague, J. B. (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1970. MEASUREMENT OF POLLUTANT TOXICITY TO FISH. II. UTILIZING AND APPLYING BIOASSAY RESULTS. Water Research, 4(1): 3-32.

It is now possible to predict toxicity of mixtures of two or more pollutants on the basis of chemical measurements. Toxicities of individual components are added up as fractions of the incipient LC50 (lethal threshold concentration). Total toxicity of the mixture is expressed as a single number. A standard terminology is given for the effects of two or more toxicants acting simultaneously. Modifying conditions (temperature, water hardness, etc.) greatly affect toxicity. Much fragmentary information should be brought together and examined for underlying patterns. Concise summaries for estimating modifying effects have been published for rainbow trout. Computerized multivariable analysis is a promising tool, especially for studies of sublethal toxicity. Effects of fluctuating concentrations of toxicants may be evaluated by four approximate techniques; the theoretical basis for understanding effects still seems unproven. Acclimation to toxicants should be studied in detail for representative pollutants. There is a great deal of information on relative resistance of different species of fish but it needs summarizing. A trend towards use of 'standard' fish species in research is good. With invertebrates and algae, as much as with fish, tests of sublethal effects such as growth and development are often more meaningful than tests of acute toxicity. Chemical autopsy methods seem promising, more so than histo-pathological approaches, which suffer from practical difficulties in field situations. (Auth.)

13013. Walden, C. C., T. E. Howard and G. C. Froud (Brit. Columbia Research, Vancouver, Canada). 1970. A QUANTITATIVE ASSAY OF THE MINIMUM CONCENTRATIONS OF KRAFT MILL EFFLUENTS WHICH AFFECT FISH RESPIRATION. Water Research, 4(1): 61-68.

Procedural variables, in the buccal cavity technique for measuring the cough response of fish to kraft mill effluents, have been examined. The quantitative procedure which was developed can measure the threshold concentration level at which effluents produce respiration abnormalities in fish. The elapsed time requirement for this assay is the same as for an acute bioassay. Minimum response concentrations, for neutralized pulping and bleaching effluents from a typical modern kraft pulp mill, were 1.1 and 4.0 percent respectively. The nature of aberrations observed in the respiration of fish exposed separately to pulping and bleaching effluents was identical, indicating that these effluents may contain similar toxic principles. Cough response observations indicate that fish acclimate to sublethal concentrations of kraft effluents, the time required for acclimation being related directly to the effluent concentration. (Authors)

13014. Wissmar, Robert C., and Fred W. Rabe (Dept. of Biol. Science, Univ. of Idaho, Moscow, Idaho). 1970. CRUSTACEAN POPULATIONS AND SAMPLING TECHNIQUES IN FOUR MOUNTAIN LAKES OF IDAHO. Trans. Amer. micr. Soc., 89(2): 205-215.

Population densities and horizontal dispersion of limnetic crustaceans are compared in four mountain lakes in northeast Idaho. Samples were based on vertical plankton hauls using four different field methods of collection together with various sample sizes. Mean total crustacean estimates were used to compare population densities. Fisher's coefficient of dispersion ($S^2/\bar{x}$) was computed for all samples and used as a measure of horizontal dispersion. Mean total crustacean density and dispersion approximate taxa density and dispersion. The four lakes have similar species composition and low density of crustaceans. (Authors)

13015. Mantel'man, I. I. 1969. ON THE POSSIBILITY OF POLYSPERMY IN BONY FISHES. Doklady Biological Sciences, 189(1-6): 820-823.

13016. Flain, M. (Fisheries Lab., Marine Dept., Christchurch, New Zealand). 1970. PRECOCIOUS MALE QUINNAT SALMON Oncorhynchus tshawytscha (Walbaum) IN NEW ZEALAND. New Zealand Journal of Marine and Freshwater Research, 4(2): 217-222.

Samples of yearling parr of quinnat salmon Oncorhynchus tshawytscha (Walbaum) from Lake Heron and the Glenariffe Stream were examined, and precocious ripe males were found. The proportion in the population (29.2%) was higher than is recorded in North America (2.6%). (Auth.)

13017. Olifirenko, L. N. (Dept. of Marine Biol., Far Eastern Br., Siberian Dept., USSR Acad. of Sci., Vladivostok, USSR). 1970. BIOCHEMICAL DIFFERENCES OF QUALITY WITHIN POPULATIONS OF THE PINK SALMON AND THE MASU SALMON (Oncorhynchus) DURING THE SPAWNING MIGRATION. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 46-55.

The data of a biochemical study of Far Eastern salmon during the period of their spawning migration are presented. Spawning populations are shown not to be of uniform structure with respect to biochemical characteristics.

13018. Kuz'min, A. N., and A. M. Chuvatova (State Res. Inst. for Lake and River Fisheries (GosNIORKh), Leningrad, USSR). 1970. SEXUAL MATURATION AND AN ANALYSIS OF DISTURBANCES TO GAMETOGENESIS IN MALES OF THE BROAD WHITEFISH [Coregonus nasus (Pallas)] WHEN REARED IN PONDS AND LAKES IN THE NORTHWEST OF THE USSR. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 55-66.

An account is given of the results of a histological study of gametogenesis, of sexual maturation and of disturbances to spermatogenesis in the rearing of males of the broad whitefish under different ecological conditions. It is shown that in most males (up to 70%) successful growth in ponds is accompanied by disturbance to the development of the sexual cells during the period of the wave of spermatogenesis, and a description is given of these disturbances. When rearing is carried out in bodies of water without flow (lakes), degeneration of the spermatogonia may occur in addition to disturbances to gametogenesis during the period of the wave of spermatogenesis and there may probably be fatty degeneration of the testes. An analysis is given of the physiological features and quality of the sperm in relation to the degree of the disturbances to spermatogenesis. The main factor causing disturbances in the development of the reproductive system of the broad whitefish is to be found in the hydrologic conditions of ponds and lakes, which do not correspond to the ecology of this species.

13019. Vasil'chenko, O. N. (Caspian Fish. Res. Inst., Astrakhan, USSR). 1970. THE FECUNDITY AND THE STATE OF THE GONADS OF COMMON CARP AND BREAM USED FOR BREEDING IN THE VOLGA DELTA. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 67-76.

The results of an investigation have shown that highly fecund common carp are at present used for propagation on fish farms. The ovaries of most of the females were found to contain resorbing mature eggs accounting for on the average of 5% of all eggs. On the fish farms the common carp lays only part of its eggs (64% of the total number of oocytes in the generation of a given year). The remaining eggs undergo resorption. Disturbances in the development of the oocytes were noted in isolated instances in the bream. The remaining eggs accounted for 7% of the total fecundity of the females.

13020. Karzinkin, G. S., I. F. Vel'tishcheva, and M. P. Bogoyavlenskaya (All-Union Res. Inst. for Sea Fish. and Oceanogr., Moscow, USSR). 1970. STUDY OF THE RATE OF INCORPORATION OF C^{14} IN THE ORGANIC MATTER OF STURGEON [Acipenser guldenstadti (Brandt)] EGGS AND YOUNG. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 84-88.

The data of a study of the rate of incorporation of radioactive carbon in protein, glycogen and lipids at different stages in the development of young sturgeon obtained from different females are set out in this paper.

13021. Mitans, A. R. (Baltic Res. Inst. for Sea Fisheries (BaltNIIRKh), Riga, USSR). 1970. THE FEEDING OF BALTIC SALMON SMOLTS IN THE RIVER AND IN THE SEA. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 89-95.

In the river Baltic salmon smolts feed on amphipods and benthic insect larvae and differ little in feeding behavior from parrs. After downstream migration to the Gulf of Riga the smolts soon begin intensive feeding on new food items, mainly young fishes and insects. The young salmon find excellent feeding conditions in the sea around Latvia.

13022. Gritsenko, O. F. (All-Union Res. Inst. for Sea Fish. and Oceanogr. (VNIRO), Moscow, USSR). 1970. FATNESS AND CONDITION OF THE ARCTIC CHAR [Salvelinus alpinus (L.)] FROM NORTHERN SAKHALIN. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 95-101.

The eggs and larvae of salmon of the genus Oncorhynchus are the basic food of the Arctic char Salvelinus alpinus (L.) in most of the bodies of water of Sakhalin. The fat content and condition of the char are dependent on the amount of this food and the times at which it is consumed. In rivers where the spawning of the salmon is protracted, lasting until the winter, the char is fatter than in rivers where spawning is brief, taking place in the summer months. Correspondingly the char are found to be fattest in the former rivers at the end of the winter and in the spring and in the latter rivers at the end of the summer and at the beginning of the fall.

13023. Natochin, Yu. V., M. M. Sokolova, G. P. Gusev, Ye. I. Shakhmatova, and Ye. A. Lavrova (Inst. of Evol. Physiol. and Biochem. (the I. M. Sehenov Inst.), USSR Acad. of Sci., Leningrad, USSR). 1970. AN INVESTIGATION OF THE ROLE OF THE KIDNEYS IN CATION HOMEOSTASIS IN ANADROMOUS AND FRESHWATER FISHES OF LAKE DAL'NEYE (KAMCHATKA). Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 101-111.

In order to characterize the ion-regulating function of the kidneys of the sockeye, Oncorhynchus nerka (Walb.), at different stages in the migratory cycle, the downstream-migrating young of the coho salmon, Oncorhynchus kisutch (Walb.), and freshwater fishes - Dolly Varden char, Salvelinus malma (Walb.), and stickleback, Gasterosteus aculeatus (L.), were given intramuscular injections of solutions of chloride salts of Na, K, Ca or Mg (1-2 meg/100g). The injection of $MgCl_2$ led to a sharp intensification of Mg secretion in downstream-migrating young and migrating sockeye and downstream-migrating young coho and to a lesser extent in the char, stickleback and spawning sockeye. Following injection of NaCl, Na excretion was slightly increased owing to a reduction in its reabsorption: Ca secretion increased following injection of $CaCl_2$. The level of K secretion was not altered after injection of KCl. In the downstream-migrating young of the sockeye and the coho Na reabsorption in the kidney was inhibited by hydrocortisone, arginine-8-vasopressin, oxytocin and the diuretics aldactone and brinaldix (Sandoz, A. G., trade name), but was perceptibly intensified after injection of Mg and Ca. Analysis of the ion composition of the muscles showed that they are not a specific depot for Na and Mg following injection of their salts. These data indicate the important role played by the kidneys of fishes in the restoration of Mg homeostasis. The kidney of the anadromous young of the sockeye and the coho is apparently capable of functioning while still in fresh water like the kidney of marine fishes.

13024. Volkova, L. A. (Baikal Biol. Sta., Biol. and Geogr. Res. Inst., Irkutsk State University (the A. A. Zhdanov University) USSR). 1970. THE INFLUENCE OF FEEDING AND STARVATION ON THE BEHAVIOR OF PLANKTON-FEEDING FISHES OF LAKE BAIKAL UNDER DIFFERENT ILLUMINATION CONDITIONS. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 117-127.

Experiments were carried out with plankton-feeding fishes (the Baikal omul and the yellowfin Baikal sculpin) of different ages. It has been established that there is no significant difference in relation to light between fed and hungry fishes. A positive reaction to light is manifested in young in the early stages from the time of hatching from the egg until an age of 1.5 months irrespective of the amount

of food consumed. At an age of two months the Baikal omul is still attracted by light, but only by light of low strength. At an age of 2.5-3 months the omul shuns light even when of low strength. The adult omul and the adult yellowfin sculpin keep to the least illuminated areas in the photic gradient. It has been shown that the daily rhythm of increased feeding and motor activity at dawn and dusk under natural conditions of the alternation of illumination is maintained in the omul and the yellowfin sculpin in the absence of food under conditions of artificially created photic gradients. No positive reaction to light was noted in the omul when kept without food for several days. However, a conditioned reflex of movement to light was elaborated following prolonged feeding of the omul only in the light.

13025. Il'ina, L. K. (Inst. of the Biol. of Inland Waters, USSR Academy of Science, Borok, Yaroslavl Prov., USSR). 1970. QUALITATIVE DIFFERENCES IN YOUNG PERCH [Perca fluviatilis (L.)] AND IRREGULAR GROWTH OF THE SCALES IN PERCH FINGERLINGS. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 141-146.

13026. Nazarenko, L. D. (Proj. Lab. for the Study of Trace Elements, Ul'yanovsk Agric. Inst., USSR). 1970. AGE-RELATED CHANGES OF COPPER AND ZINC CONTENT IN BREAM [Abramis brama (L.)] OF KUYBYSHEV RESERVOIR. Journal of Ichthyology (Voprosy Ikhtiologii), 10(1): 150-152.

13027. Waterman, Talbot H., and Richard B. Forward, Jr. (Dept. of Zool., Yale Univ., New Haven, Connecticut). 1970. FIELD EVIDENCE FOR POLARIZED LIGHT SENSITIVITY IN THE FISH Zenarchopterus. Nature, 228(5266): 85-87.

Consistent evidence is reported that the hemiramphid teleost Zenarchopterus, a west Pacific half-beak, can have its directional preferences affected by linearly polarized light.

13028. Wigle, Donald T., and Gordon H. Dixon (Dept. of Biochem., Faculty of Medicine, Univ. of Br. Columbia, Vancouver, Brit. Columbia, Canada). 1970. TRANSIENT INCORPORATION OF METHIONINE AT THE N-TERMINUS OF PROTAMINE NEWLY SYNTHESIZED IN TROUT TESTIS CELLS. Nature, 227(5259): 676-680.

Evidence is obtained in another eukaryotic system for the universal role of methionine as the initiating amino-acid in protein synthesis.

13029. Braun, K., H. Künnemann, and H. Laudien (Zool. Inst. der Univ. Kiel, Kiel, Germany (FRG)). 1970. THE INFLUENCE OF TEMPERATURE CHANGES ON ENZYMES OF THE FISH MUSCLE. EXPERIMENTS WITH Rhodeus amarus. Marine Biology, 7(1): 59-70.

The enzyme activities estimated in the muscles of Rhodeus amarus (Bloch) may vary according to the kind of muscle, age and sex of the test individuals, as well as with the time of day, and the season. Oxygen consumption of individuals acclimated to different temperatures was tested at 22°C. At low adaptation temperatures, no adaptation was found; at high adaptation temperatures, however, compensation could be ascertained. In view of the considerable fluctuation of the enzyme activities, estimated from individuals adapted to different temperatures, a relation to certain adaptation types is hardly possible. During the first days following sudden or slow changes of adaptation temperature (increase or decrease) more or less marked fluctuations of enzyme activities were obtained. Later, however, in accordance with the proceeding adaptation, a new, labile balance was established. Temperature changes represent a physiological stress even within normal temperature ranges. This fact requires general attention in studies on biological processes. Disturbance of a newly established balance of enzyme activities can be obtained, when test fishes are exposed to high temperatures. This finding may be of importance in regard to the heat resistance of the animals. (Authors)

13030. Künnemann, H., H. Laudien, and H. Precht (Zool. Inst. der Univ. Kiel, Kiel, Germany (FRG)). 1970. THE INFLUENCE OF TEMPERATURE CHANGES ON ENZYMES OF FISH MUSCLES. EXPERIMENTS WITH GOLDEN ORFS Idus idus. Marine Biology, 7(1): 71-81.

Succinate respiration and various enzyme activities were measured in the white dorsal muscles of golden orfs (gold-coloured race of Idus idus L.) adapted to different temperatures. Some of the values obtained on enzyme activities measured on successive days revealed significant differences in fish adapted to the same temperature. These differences could not be attributed to variations between experimental groups, nor to disturbances caused by the removal of some fish. In adaptation experiments, attention must be paid to diurnal fluctuations in enzyme activity; such fluctuations were especially apparent with isocitrate-dehydrogenase. Season can also influence the level of enzyme activity, possibly through changes in day-length. Succinate respiration of golden orfs adapted to 5°C is about 10% higher than in individuals adapted to 20°C (experimental temperatures 25°C). Following reverse adaptation from 20° to 5°C (at the rate of 5C°/h), the values approach, after fluctuations, those of 5°C individuals. After raising or lowering the adaptation temperature at the rate of 5 or 2C°/h), fluctuations in several enzymes appeared initially; even if significant, these were, however, not always reproducible. Changes in temperature causes a limited phase of increased functional lability. (Authors)

13031. Meincke, K. F. (Zool. Inst. der Univ. Kiel, Kiel, Germany (FRG)). 1970. THE INFLUENCE OF TEMPERATURE VARIATIONS ON THE ION AND WATER CONTENT IN BLOOD PLASMA AND TISSUES OF Tinca tinca. Marine Biology, 6(4): 281-290.

Two-year-old Tinca tinca L. (previously acclimated for at least 3 weeks to defined temperatures) were subjected to slow (24 h) and fast (2 h) temperature changes from 13.5° to 26°C (observational period 504 h) and from 6° to 16°C and vice versa (observational period 288 h). Effects on coefficient of condition, Na, K, Ca and Cl content of plasma, H_2O, Na and K content of muscle and liver, and rates of movement of gill-covers, when the temperature rose to 26°C, were recorded. After temperature change from 13.5° to 26°C, sharp increases occur in the amount of K and Cl in the blood plasma, of H_2O in the liver and, if the temperature rise is effected quickly, of muscle H_2O content. Substantial reductions were recorded in coefficient of condition and K content of the liver. With a fast rise in temperature, liver Na content decreases sharply at first, but rises again later. After temperature change from 6° to 16°C, Ca increase in blood plasma and (if the temperature is raised slowly), decline in muscle Na content are considerable; drop of liver H_2O content is less marked. If the temperature change is effected rapidly, then liver Na content and plasma K diminish initially and, thereafter, rise sharply. In the case of quick temperature change from 16° to 6°C, particularly frequent and marked changes in ion and water contents occur; in most cases adjustment is not complete after 288 h, and the observed variations are often clearly different from those observed in the case of slow temperature change. If temperature is lowered rapidly, the amounts of Na and K in muscle and liver fall and the amount of H_2O increases. There is a considerable loss of Na and Cl contents and, after rapid temperature change, also in plasmatic K and Ca contents. The responses of fishes acclimated to 6° and 16°C are compared; at 16°C the coefficient of condition and plasmatic Na, K and Cl contents decrease, and H_2O, Na and K contents of the liver increase. The amount of K in the plasma and of H_2O, Na and K in the muscle remains unchanged. The stress effect upon ion and water contents during transfer to 6°C is significantly greater during fast than during slow temperature change. The problem of proper differentiation between biological consequences of stress and adaptation phenomena is discussed. Complete adaptation was frequently not attained during the course of our experiments, especially not at low temperatures. (Auth.)

13032. Galkina, L. A. (Murmansk Marine Biol. Inst., Academy of Sci., USSR, Dalnie Zelenzi, USSR). 1970. FERTILIZATION AND EARLY DEVELOPMENTAL STAGES OF EGGS OF Clupea harengus pallasi n. maris-albi UNDER FRESH-WATER CONDITIONS. Marine Biology, 6(4): 303-311.

Eggs of the White Sea herring Clupea harengus pallasi Val. are laid in the intertidal zone, where they are liable to come under the influence of fresh water. The present paper deals with the effect of fresh-water influence on the egg of the White Sea herring, under experimental conditions. In fresh water, egg and sperm are in an unactivated state and, after transfer into sea water, are capable of re-activation, even after 2-1/2 h exposure. The treated eggs develop until the hatching of normal and viable larvae. The number of eggs which are able to complete development depends upon the period of fresh-water exposure, although the correlation between the length of that period and survival rates is not very close. Apparently, this is due both to the ability of C. harengus pallasi eggs to develop parthenogenetically and different qualities of eggs (which were obtained from different females). The morphological features of White Sea herring eggs, induced by experimental fresh-water influence, are very similar to those typical for herring eggs of the genus Ilisha, obtained from natural brackish waters. However, such changes are not characteristic of the eggs of forms from natural fresh and brackish-waters. (Auth.)

13033. Preston, A. (Min. of Agric., Fish. and Food, Fish. Radiobiol. Lab., Lowestoft, England). 1970. CONCENTRATIONS OF IRON-55 IN COMMERCIAL FISH SPECIES FROM THE NORTH ATLANTIC. Marine Biology, 6(4): 345-349.

Concentrations of the weapon-test, fallout radionuclide iron-55 have been reported for migratory species, such as the Pacific salmon, which suggest a marked decrease in concentration with decrease in latitude of the point of capture. This situation has been examined for North Atlantic cod stocks in order to provide data for a species representative of a large geographical area, but divided into more or less distinct stocks each with a restricted territory, in order to provide further data on the importance of latitude in determining iron-55 cencentrations. The data obtained show that there is a marked dependence upon latitude, Arctic cod averaging 90pCi ^{55}Fe/mg Fe compared with 15pCi ^{55}Fe/mg Fe for cod from middle latitudes. The mechanisms that could lead to such distribution are examined, and it is concluded that deposition of this radionuclide was exceptionally high over the sea in northern latitudes compared with its deposition on land, and that this pattern of deposition, taken together with the very high biological availability of the material at the time of deposition, has led to the very high specific activities found in northern latitudes and recorded for Arctic cod stocks in particular. (Auth.)

13034. Hunn, Joseph B. (Bur. of Sport Fisheries and Wildlife, Fish Control Lab., La Crosse, Wisconsin). 1970. DYNAMICS OF MS-222 IN THE BLOOD AND BRAIN OF FRESHWATER FISHES DURING ANESTHESIA. U. S. Dept. of Interior, Bur. of Sport Fish. and Wildl. Investigations in Fish Control No. 42, pp. 3-8.

Eleven species of freshwater fishes were rapidly anesthetized in solutions of MS-222 containing from 100 to 1,000 milligrams of MS-222 per liter. MS-222 concentrations in blood and brain after 1 minute of exposure indicate that MS-222 rapidly diffuses across the gill and passes the blood-brain barrier. Evidence of metabolism of the drug was seen in the presence of acetylated MS-222 in the blood of all species studied. The concentration of free MS-222 in the brain increased with depth of anesthesia to loss of reflex and then either increased or declined slightly as the fish approached medullary collapse. (Auth.)

13035. Tsoi, R. M. 1969. EFFECT OF NITROSOMETHYL UREA AND DIMETHYL SULFATE ON SPERM OF RAINBOW TROUT (Salmo irideus Gibb.) AND PELED (Coregonus peled Gmel.). Doklady Biological Sciences, 189(1-6): 849-852.

13036. Allen, John L., Charles W. Luhning, and Paul D. Harman (Bur. of Sport Fisheries and Wildlife, Southeastern Fish Control Lab., Warm Springs, Georgia). 1970. IDENTIFICATION OF MS-222 RESIDUES IN SELECTED FISH TISSUES BY THIN LAYER CHROMATOGRAPHY. U. S. Dept. of Interior, Bur. of Sport Fish. and Wildl. Investigations in Fish Control No. 41, pp. 3-7.

MS-222, a commonly used fish anesthetic, reacts with the Bratton-Marshall reagents to form a wine-red dye. Residues of MS-222 determined by this reaction are not distinguished from other primary aromatic amines. Thin layer chromatography was used to identify MS-222 in the presence of background primary aromatic amines in fish muscle, brain, and blood. This method, in which the Bratton-Marshall reaction is used to visualize the spots, gave both the specificity of the Bratton-Marshall reaction for primary aromatic amines and the R_f of MS-222 as tools for identification of the residues. Recoveries of 25 to 60 percent were obtained in muscle samples spiked with 2 to 10 ppm of MS-222. Quantitative estimation was difficult in samples spiked with 2 ppm or less, but presence of MS-222 residues could be confirmed in samples spiked with as little as 0.2 ppm. Since the meta-aminobenzoate ester can be identified at these concentrations, this should be a useful ancillary or confirmatory method for determining the rate of disappearance of drug residues in fish flesh and obtaining data for clearance and registration of the anesthetic with the Food and Drug Administration. (Authors)

13037. Willford, Wayne A. (Bur. of Sport Fisheries and Wildlife, Fish Control Lab., La Crosse, Wisconsin). 1970. EFFECT OF MS-222 ON ELECTROLYTE AND WATER CONTENT IN THE BRAIN OF RAINBOW TROUT. U. S. Dept. of Interior, Bur. of Sport Fish. and Wildl. Investigations in Fish Control No. 43, pp. 3-7.

Rainbow trout (Salmo gairdneri) were exposed to 100-milligrams-per-liter solutions of MS-222 for 1-, 2-, 4-, and 10-minute intervals and their brains were analyzed for sodium, potassium, calcium, magnesium, zinc, iron, and water content. The mean potassium content decreased 17.7 percent and iron increased 56.2 percent during 2-minute exposures. Sodium and calcium increased slightly (7.2 and 9.4 percent); magnesium, zinc, and water content remained relatively constant. All of the affected electrolytes returned toward control values with 4- and 10-minute exposures. These shifts in electrolytes appear to be related to depth of anesthesia and to the concentrations of free MS-222 in the brain. (Auth.)

13038. U. S. Dept. of the Interior, Bur. of Commercial Fisheries. 1970. BUREAU OF COMMERCIAL FISHERIES TROPICAL ATLANTIC BIOLOGICAL LABORATORY, PROGRESS IN RESEARCH, 1965-69, MIAMI, FLORIDA. U. S. Fish Wildl. Serv. Circ. No. 344, 65 p., illus.

The history, facilities, and programs of the laboratory are described. The development of the tuna fishery in the tropical Atlantic Ocean, mid-1950's to mid-1960's, is discussed. Condensed cruise reports of the research vessels Geronimo and Undaunted are included.

13039. Craven, Richard E., and Bradford E. Brown (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma). 1969. BENTHIC MACROINVERTEBRATES OF BOOMER LAKE, PAYNE COUNTY, OKLAHOMA. The Southwestern Naturalist, 14(2): 221-230.

A study of benthic macroinvertebrates in a 102 ha lake was conducted from March, 1966 through February, 1967. Of the thirty taxa collected, seven (Chaoborus punctipennis (Say), Caenis, Sialis, Hexagenia, Hyalella azteca (Saussure), Branchiura sowerbyi Beddard, and Tendipedidae) comprised 82.74 to 99.51% of the total organisms collected monthly. Seven taxa of oligochaetes were collected, the most abundant being B. sowerbyi. Abundance of C. punctipennis increased as depth of water increased. Depth distribution of Tendipedidae was unclear since the family was treated as a single taxon. Other taxa, except Hexagenia which is treated in another presentation were not abundant enough in collections to elicit a distinct depth distribution. Variation and abundance of fauna may have been limited by silt depositions during run-off. The amount of silt was apparent by the abundance of Hexagenia. (Authors)

13040. Spall, Richard D., and Robert C. Summerfelt (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma). 1969. HOST-PARASITE RELATIONS OF CERTAIN ENDOPARASITIC HELMINTHS OF THE CHANNEL CATFISH AND WHITE CRAPPIE IN AN OKLAHOMA RESERVOIR. Bull. Wildlife Disease Assoc., Vol. 5, pp. 48-67.

Fifteen identified species and 13 genera, of endoparasitic helminths (Digenea, Eucestoda, Nematoda, Acanthocephala) were collected from 207 white crappie and 189 channel catfish June, 1967, through September, 1968, and from a 3,300-acre, turbid reservoir in northcentral Oklahoma. Differences in the prevalence and intensity of helminths from six reservoir collection sites were not statistically significant. Statistically significant differences in intensity and prevalence of certain helminths were found among different age classes of the hosts. Ontogenetic changes in the food habits of channel catfish, from a diet of invertebrates to fish, were apparently the reason for changes in the occurrence of many enteric helminths. The occurrence of some helminths, however, was independent of age. Changes relating to age in the crappie were limited to the occurrence of Posthodiplostomum minimum where multiple generations of metacercariae accumulate in older fish. These metacercariae occurred in significantly higher numbers in males. Otherwise the occurrence of parasitism did not differ significantly between the sexes. Seasonal differences in parasitism, heretofore rarely studied, were pronounced, reflecting changes in feeding, metabolism, and the reproductive cycle of the host, and the annual life cycle characteristics of the parasite. Some parasites, such as Dacnitoides robusta, were absent in the channel catfish in the winter but abundant in the summer. Conversely, proteocephalid tapeworms from the channel catfish were abundant in the winter and infrequent in the summer. Observations on the pattern of seasonal variation in prevalence and degree of infection of Posthodiplostomum minimum in the white crappie suggests that it may contribute to summer mortality of its host. (Authors)

13041. Cowell, Bruce C. (No. Central Reservoir Res. Investigation, Bur. Sport Fish. and Wildl., Yankton, South Dakota). 1970. THE INFLUENCE OF PLANKTON DISCHARGES FROM AN UPSTREAM RESERVOIR ON STANDING CROPS IN A MISSOURI RIVER RESERVOIR. Limnol. & Oceanogr., 15(3): 427-441.

The influence of discharges from an upstream reservoir, Lake Francis Case, on the standing crops in Lewis and Clark Lake, 71 km down the Missouri River, was assessed by automatic plankton samplers installed in the powerhouses. Composite samples were collected weekly from January 1966 through December 1967. Densities of total Copepoda and Cladocera were significantly greater in the upstream reservoir; populations downstream were dependent on upstream discharges. Discharge and water exchange rates in Lewis and Clark Lake were too rapid for significant development of Copepoda and Cladocera; only three species showed population increases between powerhouses. In contrast, phytoplankton and rotifers were more abundant downstream, especially in summer when introductions from the Niobrara River and production within Lewis and Clark Lake produced marked differences between reservoirs. Phytoplankton and zooplankton populations in both reservoirs were exceptionally low during summer. Low concentrations of nutrients and low photosynthetic rates in the upstream reservoir appear to be the limiting factors. (Auth.)

13042. Lorenzen, Carl J. (Woods Hole Oceanogr. Inst., Woods Hole, Massachusetts). 1970. SURFACE CHLOROPHYLL AS AN INDEX OF THE DEPTH, CHLOROPHYLL CONTENT, AND PRIMARY PRODUCTIVITY OF THE EUPHOTIC LAYER. Limnol. & Oceanogr., 15(3): 479-480.

The statistical relationships between surface chlorophyll concentration and the depth, chlorophyll content, and primary productivity of the euphotic layer have been investigated. They all proved to be statistically significant. (Auth.)

13043. Smirnov, S. A. 1969. DEVELOPMENT OF SENSORY ORGANS OF THE LATERAL LINE SYSTEM IN RUFFE (Acerina cernua L.). Doklady Biological Sciences, 189(1-6): 824-826.

13044. Balakrishnan, K. P., and C. B. Lalithambika Devi (Oceanogr. Lab., Univ. of Kerala, Cochin, India). 1970. PRELIMINARY OBSERVATIONS ON THE CIRCULATORY SYSTEM IN EGGS AND EARLY LARVAE OF SOME TELEOSTEAN FISHES. Marine Biology, 6(3): 256-261.

Observations on the pattern of blood circulation in eggs and early larvae of Ambassis, Mugil, Dorosoma and Thrissocles species have been made. In the initial stages, the tubular heart lies on the left side, near the cephalic region. The anterior end of the heart lies near the snout. The posterior end is attached to a point mid-way between the orbits and auditory vesicles; the position of the anterior end is greatly influenced by the size of yolk. Initially, the tubular heart and dorsal aorta lie in a line. As a result of yolk absorption, the anterior end of the tubular heart gradually sinks to a position posterior to the attached end. Liquified yolk is circulated through the heart in early stages; blood corpuscles become apparent only in larvae. The heart-beat, which is initially irregular, gradually becomes regular as development progresses. In the initial stages the blood flows to the caudal and not to the cephalic region. The blood vessels are narrow, and the oval-shaped blood corpuscles must therefore pass through individually, with their long axes parallel to the passage. A definite capillary system is not evident. The blood vessels can dilate and contract when required. (Authors)

13045. Gerday, Ch., and K. S. P. Bhushana Rao (Lab. de Biol. gen., Inst. Ed. Van Beneden, Univ. de Liege, Belgium). 1970. TRYPTIC PEPTIDE MAPS AND TERMINAL AMINO ACID RESIDUES OF LOW MOLECULAR WEIGHT PROTEINS FROM THE WHITE MUSCLES OF Cyprinus carpio, Gadus callarias AND Tilapia macrochir Boul. Comp. Biochem. Physiol., 32(2): 229-240.

The tryptic peptide maps of seven low molecular weight albumins purified from the white muscles of Cyprinus carpio (carp), Gadus callarias (cod) and Tilapia macrochir Boulenger are dealt with in detail. The results provide additional support to our previously proposed homology of these fish albumins. Our extended investigations to find out the terminal amino acid residues revealed that N-terminal amino acid is acetylated; carboxy-peptidase A, B as well as hydrazinolysis have not liberated any free C-terminal residue in these proteins. (Authors)

13046. Oide, Momoko (Lab. of Physiol., Ocean Res. Inst., Univ. of Tokyo, Tokyo, Japan). 1970. PURIFICATION AND SOME PROPERTIES OF ALKALINE PHOSPHATASE FROM INTESTINAL MUCOSA OF THE EEL ADAPTED TO FRESH WATER OR SEA WATER. Comp. Biochem. Physiol., 36(2): 241-252.

The alkaline phosphatase in the intestinal mucosa from fresh-water-adapted and sea-water-adapted eels was purified. Total and specific activities of this enzyme were higher by three-fold in sea-water-adapted than in fresh-water-adapted eels. There was little difference in properties between these two enzyme preparations. It appears that the adaptation of the eel to sea water enhances the production of an alkaline phosphatase in the intestinal mucosa. (Auth.)

13047. Brown, Edward H., Jr., and Carroll R. Norden (Great Lakes Fishery Lab., U. S. Bur. of Comm. Fisheries, Ann Arbor, Michigan). 1970. FIN DEGENERATION OF YOUNG-OF-THE-YEAR Alosa pseudoharengus (CLUPEIDAE) IN SOUTHERN LAKE MICHIGAN. Copeia, No. 4, pp. 767-769.

Young-of-the-year alewives, Alosa pseudoharengus, with extremely shortened caudal fins were observed at four locations in southern Lake Michigan between 1964 and 1968. Microscopic examination revealed a deterioration of the fins and not an ontogenetic abnormality. Regeneration was observed in some fish. Fin rot and nutritional deficiency are suggested as possible causes. The swimming of such fish is impaired.

13048. Gulidov, M. V. 1969. SURVIVAL AND CERTAIN FEATURES OF DEVELOPMENT OF PIKE (Esox lucius L.) EMBRYOS AT DIFFERENT OXYGEN CONDITIONS OF INCUBATION. Doklady Biological Sciences, 189(1-6): 811-813.

13049. Ehrlich, Karl F., and David A. Farris (Dept. of Biol., San Diego State Coll., San Diego, California). 1970. EFFECT OF TEMPERATURE ON NUMBER OF MYOMERES IN NEWLY HATCHED GRUNION (Leuresthes tenuis). Copeia, No. 4, pp. 774-775.

Myomere numbers, in the grunion, seem to be susceptible to changes in temperature. Information collected in this study supports the generality that meristic characters of many species of fishes, incubated at warmer temperatures, tend to have fewer elements than those incubated under cooler conditions. This is also further evidence that meristic characters are not valid criteria for differentiating races of some fishes.

13050. Hettler, William F., Jr. (Nat. Mar. Fish. Serv. Center for Estuarine and Menhaden Res., Beaufort, North Carolina). 1970. REARING LARVAE OF YELLOWFIN MENHADEN, Brevoortia smithi. Copeia, No. 4, pp. 775-779.

Yellowfin menhaden, Brevoortia smithi, were reared from eggs to 15 mm larvae in February 1968. Three days after hatching, food was provided in the form of sea urchin blastulae, and algae. The larvae evidently fed only on the blastulae. From approximately 2000 eggs, about 100 larvae survived through the fourth day after hatching. Two weeks after hatching, when only 20 survived, brine shrimp nauplii were added to their diet. The last larva, 14.9 mm, died 32 days after hatching. Many of the deaths were caused by embolism due to supersaturation of the inflowing water with air.

13051. Fontana, F., B. Chiarelli, and A. Rossi (Instituto di Antropologia Universita di Torino, Torino, Italy). 1970. SOME NEW DATA ON THE NUMBER OF CHROMOSOMES OF TELEOST FISH OBTAINED BY MEANS OF TISSUE CULTURE IN VITRO. Experientia, 26(9): p. 1021.

Numbers of chromosomes of certain teleost fishes are given: Lepomis gibbosus - 46 (2n); Brachydanio rerio - 50 (2n); Leuciscus cephalus - 50 (2n); Alburnus albidus alborella - 50 (2n); and others.

13052. McKenzie, Laura S., and N. G. Stephenson (School of Biol. Sci., Univ. of Sydney, Sydney, Australia). 1970. THE CULTURE OF GOLDFISH CELLS (Carassius auratus) AT HIGH TEMPERATURES. Experientia, 26(9): p. 1027.

The cells of Carassius auratus have been cultured in vitro with success at temperatures as high as 39°C, testicular cells in series of 28 sub-cultures at 31.5°C and 6 sub-cultures at 37.5°C. (Authors resume)

13053. Rothwell, B., and S. Fielding (School of Biol. Sci., Bath Univ. of Technol., Bath, England). 1970. INDICATION OF AN 'INSULIN LIKE' FACTOR IN THE PANCREATIC TISSUE OF THE RIVER LAMPREY Lampetra fluviatilis (L.). Experientia, 26(10): 1151-1153.

The existence of a positive pseudo-isocyanine factor resembling insulin is established in histological sections and in chromatogrammed extracts of the cellular cords of the pancreas of Lampetra fluviatilis. Moreover, the acid extract of these cords, injected into the rabbit and the lamprey, produces a significant hypoglycemic effect. (Authors resume)

13054. Summerfelt, Robert C. (Okla. Coop. Fish. Unit, Oklahoma State Univ., Stillwater, Oklahoma). 1967. FISHES OF THE SMOKY HILL RIVER, KANSAS. Trans. Kansas Acad. of Sci., 70(1): 102-139.

This report represents a published record of the population composition of the river during the initial stages of development of agricultural irrigation in the Cedar Bluff Irrigation District. (From auth. introduction)

13055. Summerfelt, Robert C. (Okla. Coop. Fish. Unit, Oklahoma State Univ., Stillwater, Oklahoma). 1967. COMMERCIAL SPORTS FISHING ENTERPRISES AND NEW POSSIBILITIES FOR FISHING DOCK OPERATORS. Third Ann. Okla. Outdoor Recreation Conf., March 1967, Oklahoma State Univ.).

13056. Pulford, Earl F. (Fish Comm. of Oregon, Hatchery Biol. Section, Clackamas, Oregon). 1970. ESTIMATED CONTRIBUTION OF COLUMBIA RIVER HATCHERY FALL CHINOOK SALMON TO SPORT AND COMMERCIAL FISHERIES IN 1966. Research Reports of the Fish Comm. of Oregon, 2(1): 3-14.

A program was designed to measure the contribution of Columbia River hatchery produced fall chinook to the salmon fisheries. Approximately 10% of the output from 12 hatcheries were fin marked for 4 consecutive years. In 1966 all four ages (2-5) dominant in the catch were represented by marked salmon. Sampling for marked fish was conducted in all the major salmon fisheries where it was believed they might be caught. This paper provides estimates of the general magnitude of the hatchery contribution to the harvest together with its distribution by geographic area and age of the fish at time of capture. It is estimated that 274, 000 hatchery fall chinook were taken in the fisheries, with 87% being taken in the ocean and 13% in the Columbia River. About 81% were caught along the coasts of Washington and British Columbia, 5% off the Oregon coast, and less than 1% off Alaska and California. The dominant age of hatchery fish at time of capture was 3 years. Two-year-old hatchery chinook contribute little to the troll catch, but are important in the sport catch. (Auth.)

13057. Loeffel, Robert E., and William O. Forster (Fish Comm. of Oregon, Res. Div., Clackamas, Oregon). 1970. DETERMINATION OF MOVEMENT AND IDENTITY OF STOCKS OF COHO SALMON IN THE OCEAN USING THE RADIONUCLIDE ZINC-65. Research Reports of the Fish Comm. of Oregon, 2(1): 15-27.

The radioisotope, ^{65}Zn, which occurs in the Columbia River plume because of the Atomic Energy Commission operations at Hanford on the Columbia River, is assimilated by coho and if retained long enough biologically has a sufficient half life (245 days) to serve as a natural mark for coho. Zinc-65 was studied as a marker by comparing ^{65}Zn levels in coho taken along the British Columbia-S. E. Alaska coast during the summer months north of the Columbia River plume, and in the suspected migratory path for Oregon-Washington coho during their first few months in the ocean. Bering Sea coho were included to provide a measure of ^{65}Zn that was not of Hanford origin. Samples were collected by the University of Washington Fisheries Research Institute and were passed on to the Oregon State University Department of Oceanography for radioanalysis. Variation in activity between coho collected in time-space subdivisions within each year was observed. The variation was taken as evidence that coho originating from streams south of the area of collection were in the sample as well as coho from British Columbia and S. E. Alaska. The levels of activity appeared to be high enough that if coho so marked were caught 6 months later on the high seas they would be distinguishable from unmarked coho. Most fish contained some ^{65}Zn above background levels, which suggests that ^{65}Zn is carried farther north than the plume appears to take it. The presence of fish with high levels of ^{65}Zn in the northern samples supports the thesis that a northward migration of Oregon-Washington juvenile coho occurs. (Authors)

13058. Lander, Robert H. (Nat. Mar. Fish. Serv. Biol. Lab., Seattle, Washington). 1970. DISTRIBUTION IN MARINE FISHERIES OF MARKED CHINOOK SALMON FROM THE COLUMBIA RIVER HATCHERY PROGRAM, 1963-66. Research Reports of the Fish Comm. of Oregon, 2(1): 28-55.

Preliminary data from the hatchery evaluation program of Columbia River system hatcheries were analyzed to determine the distribution of marked fall chinook salmon from different sources in the marine fisheries. Estimated catches of marked fish in 1963-66 from the 1961-64 broods were tabulated by type of fishery and port or zone of recovery. Differences in distribution from north to south were detected between fish from different hatcheries and ocean ages. Only Kalama River fish demonstrably reached Alaskan waters, but fish from nearly all hatcheries were found as far south as northern California. The relative contributions of marked fish from different hatcheries to the marine fisheries varied considerably. Specific differences among hatcheries in availability of fish to ocean sport and troll fisheries also were detected for ports

between Newport, Oregon, and Neah Bay, Washington. Apparent intraseasonal movements of Spring Creek and Kalama River fish during 1964 and 1965 agreed in some respects, but not in others, with the known schedules of their return to the Columbia River. (Auth.)

13059. Junge, Charles O. (Fish Comm. of Oregon, Research Div., Clackamas, Oregon). 1970. THE EFFECT OF SUPERIMPOSED MORTALITIES ON REPRODUCTION CURVES. Research Reports of the Fish Comm. of Oregon, 2(1): 56-63.

The relative effects of salmonid smolt kills, "racial" kills, and adult kills on a completely general reproduction curve are studied. It is shown that for nonselective mortalities, smolt kills have a greater effect on the optimum sustainable yield than racial kills and a much more severe effect than adult kills of the same magnitude. For illustration, the results are applied to a Ricker-type reproduction curve. (Auth.)

13060. Johnson, A. Kenneth (Fish. Comm. of Oregon, Hatchery Biol. Section, Clackamas, Oregon). 1970. THE EFFECT OF SIZE AT RELEASE ON THE CONTRIBUTION OF 1964-BROOD BIG CREEK HATCHERY COHO SALMON TO THE PACIFIC COAST SPORT AND COMMERCIAL FISHERIES. Research Reports of the Fish Comm. of Oregon, 2(1): 64-76.

In March 1966, two groups of fin-marked 1964-brood coho salmon were released from the Fish Commission of Oregon's Big Creek Hatchery. One group marked An-RV (anal-right ventral) was released at a size of 10.7 fish per pound, while the other group, marked An-LV (anal-left ventral), was released at a size of 27.3 per pound. The estimated catch of 3rd-year coho relative to the numbers released for the An-RV and An-LV groups was 22.1 and 11.4 fish per 1,000 released, respectively. Approximately 77% of the combined contribution of both groups were landed in the ocean fisheries. The catch distribution within the troll fishery indicated that relatively equal recoveries occurred to the north and south of the Columbia River, with recoveries to the south slightly predominating. The percentage jack returns of the numbers released for the An-RV and An-LV groups were 2.7% and 0.2% respectively, while the percentage return of An-RV and An-LV adults was 0.7% and 0.4% respectively. Based on numbers released, there was no significant difference in the percentage return of adult males between the An-RV (0.20%) and An-LV (0.18%) groups; however, the percentage return of An-RV group females (0.51%) was over twice that of An-LV group females (0.25%). The catch-to-escapement ratio for the An-RV group was 3.1:1, and for the An-LV group 2.7:1. Benefit-cost values of 1.97:1 and 2.60:1 were computed, respectively, for the An-RV and An-LV groups. (Auth.)

13061. Skeesick, Delbert G. (Fish Comm. of Oregon, Research Div., Newport, Oregon). 1970. THE FALL IMMIGRATION OF JUVENILE COHO SALMON INTO A SMALL TRIBUTARY. Research Reports of the Fish Comm. of Oregon, 2(1): 90-95.

The Fish Commission operated an upstream-downstream trap on Spring Creek, Wilson River from 1948 through 1958. Each fall an upstream migration of relatively large juvenile coho occurred. An average of 62.6% of the fall upstream migrants survived and returned downstream in the spring as smolts. The fall upstream migrants which survived to the smolt stage averaged 14 mm longer at emigration than smolts which had spent their entire lives in Spring Creek. The recapture rate of mature fish that had been fall upstream-migrant juveniles was 0.3% while the recapture rate from fish native to the stream was 0.8%. I theorized that (1) the juveniles had spent the summer rearing in the Wilson River where they had grown rapidly; (2) the juveniles entered Spring Creek in the fall to escape the high, turbulent water conditions of the main river; and (3) adults, that had been immigrants, received a permanent imprint of their natal stream and had returned there rather than to Spring Creek. Observations from two other river systems are reported to substantiate the behavior pattern and suggest that other species may have similar habits. Changes in habitat management and research concepts that will be necessary, if this behavior pattern is widespread, are discussed. (Auth.)

13062. Reimers, Paul E. (Fish Comm. of Oregon, Research Div., Port Orford, Oregon). 1970. BEHAVIOR TROUGHS WITH SIMULATED REDDS TO STUDY RECENTLY EMERGED SALMON FRY. Research Reports of the Fish Comm. of Oregon, 2(1): 96-99, illus.

Because the fate of juvenile fall chinook salmon, Oncorhynchus tshawytscha (Walbaum), in relation to residence or downstream movements is apparently determined within the first few days following emergence, systems possessing both simulated redds and rearing area were developed to study this behavior. Two systems were designed: (1) Observation troughs to examine the emergence and subsequent fate of fry in detail, and (2) emergence boxes to allow fish to emerge unobserved and enter a trap for relocation into various experimental situations. The primary advantages of these systems are: (1) All experimental fish hatch and reside in the gravel environment and then emerge directly into the observation area. (2) Alteration and measurement of redd quality is possible, i. e., gravel composition, intragravel flow, depth of planting, oxygen, and metabolite levels. Preliminary experiments with the observation troughs have been rewarding These systems are small, portable, and relatively inexpensive depending on the quality of the materials used. (From auth.)

13063. Craven, Richard E., and Bradford E. Brown (Biol. Dept., Kansas State Coll., Pittsburg, Kansas). 1970. POWER PLANT HEATED DISCHARGE WATER AND BENTHOS IN BOOMER LAKE, PAYNE COUNTY, OKLAHOMA. J. Kans. ent. Soc., 43(2): 122-128, illus.

Heated water entering Boomer Lake, Payne County, Oklahoma, resulted in stream conditions being simulated in the power plant discharge riffle. Trichoptera (Cheumatopsyche and Hydropsyche) and Dipters (Simulium vittatum Zetterstedt) were abundant in the riffle and may have supplemented the food supply of fishes in the lake. Populations of Ephemeroptera (Hexagenia), Diptera (Chironomidae), Megaloptera (Sialis), and Oligochaeta (Branchiura sowerbyi Beddard) from two areas on the lake were compared. Both areas were coves, but one had heated water entering it. Since monthly mean numbers of organisms and biomass per individual Hexagenia from the two areas were similar, the heated water apparently had little, if any, effect on the benthos. (Authors)

13064. Cohen, Mable, and Bradford E. Brown (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma). 1969. SCALE AND BODY GROWTH OF YOUNG-OF-YEAR CENTRARCHIDS IN TWO OKLAHOMA FARM PONDS. Proc. Okla. Acad. Sci., Vol. 48: 199-205.

In the two farm ponds in this study first-year growth was very slow. In addition, bluegills probably spawned at least into September, as fry were found in all collections. Lack of changes in size of fish collected in periodic seinings indicated that growth was over by the end of October for the bluegill and the bass, when temperatures were still between 60 and 70F. Not enough green sunfish were collected to provide information on cessation of growth. As determined by changes in abundance of the different size groups, spring collections indicated the possibility of higher mortality of the smallest fish spawned in late fall due to predation by largemouth bass. However, this might not be true in ponds where small fingerling bass were not present. Annulus formation occurs after the month of March. Recognition of the first annulus in sunfishes with less than two inches of growth in their first season may be difficult because of its proximity to the focus. In fact, some fishes collected in March still had scales only in the form of platelets. In these fishes no annulus formed because adult-type circuli were not formed during their first year. (From authors conclusions)

13065. Lopinot, A. C. (Div. of Fish., Illinois Dept. of Conservation, Illinois). 1970. 1969 CREEL SURVEY OF THE ILLINOIS PORTION OF LAKE MICHIGAN. Ill. Dept. of Conservation Special Fisheries Report No. 32, 46 p.

13066. Jarman, Ron (Okla. Dept. of Wildlife Conservation, Oklahoma City, Oklahoma). 1968. FOOD HABITS OF THE BIGMOUTH BUFFALO IN A SIMULATED FISH FARMING ENVIRONMENT. Reprint, Proc. of 22nd Ann. Conf. of Southeastern Assoc. of Game and Fish Comm., 6 p.

Recent growth of commercial fish farming in the South Central United States has stimulated interest in the habits of fish species adaptable to fish farm environments. In 1964, the food habits of the bigmouth buffalo, Ictiobus cyprinellus, (Valenciennes), were determined in simulated fish farming ponds by comparison of available food and stomach contents. Results indicated competition with channel catfish for food occurred only when supplemental feed is introduced. In this situation channel catfish appear to be more vigorous competitors than buffalo. Stomach contents are compared with volumetric measurements of food organisms available in the ponds. (Auth.)

13067. Craven, Richard E., and Bradford E. Brown (Dept. of Biol., Kansas State Coll., Pittsburg, Kansas). 1969. ECOLOGY OF Hexagenia NAIADS (INSECTA-EPHEMERIDAE) IN AN OKLAHOMA RESERVOIR. Amer. Midl. Nat., 82(2): 346-358.

A stratified, random sampling schedule of benthic samples was initiated to contribute information to the life history of a mayfly, Hexagenia, in Oklahoma. Sampling was carried out from March, 1966 to February, 1967, in Boomer Lake, Payne County. The Hexagenia population consisted of at least two species, H. limbata (Serville) and H. bilineata (Say), which together comprised a monthly mean of from 19 to 56% of the total number of organisms collected. Mean biomass of Hexagenia in the lake was greatest in May (8.2 kg/ha) and lowest in September (1.8 kg/ha). Mean numerical standing crop was lowest in August (148/m^2) and greatest in December (968/m^2). Period of greatest growth was approximately from March until December during 1966. During winter months, mean biomass per individual remained relatively constant. Evidence for a one-year life cycle is presented. Anoxic conditions occurred in Boomer Lake but it was not determined, from collected samples, whether or not Hexagenia populations were affected. Abundance of Hexagenia was found by statistical analysis to vary independently of depth of water and near-bottom water temperature. (Authors)

13068. Summerfelt, Robert C., and Charles O. Minckley (Okla. Coop. Fish. Unit, Stillwater, Oklahoma). 1969. ASPECTS OF THE LIFE HISTORY OF THE SAND SHINER, Notropis stramineus (Cope), IN THE SMOKY HILL RIVER, KANSAS. Trans. Amer. Fish. Soc., 98(3): 444-453.

Seasonal changes in mean egg diameter and gonadal weights indicated that spawning of Smoky Hill River sand shiners occurred May through August, with a peak in August. Mean egg diameter varied seasonally from 207 to 747 μ; mature eggs 650 to 747 μ. Spawning in the hot-dry portion of the summer, water temperature, 21-37 C, apparently enhances the survival of the young; flooding and heavy suspended solids usually characterize early summer river conditions. Spawning fish were of age-classes I and II and averaged 49.1 mm total length. The positive direct-proportion relationship between body weight and fecundity had the equation: Ec = 223.2 + 0.601 W, where Ec is the egg count, and W is the weight of the female in grams. In November-December samples, age-class-0 fish were 31.6 mm mean total length and age-class-I 47.6 mm. The conversion factor for standard length to total length was 1.28 SL. The K factor did not differ significantly between sexes; the overall K factor and 95% confidence limits was 1.66 ± 0.05 for 235 shiners. The K factors were significantly larger for those taken in June and July 1966 compared to those in the June and July 1965 collections. Sizes of fish did not differ significantly between these dates and the differences may have been due to a depleted food supply in 1965 caused by flooding and suspension of large quantities of heavy solids. Variations among the numbers of shiners collected from three stations were correlated, not independent. Variation in population density of sand shiners coincides with that of other species collected. The habitat, like the vernacular name, is shallow, sandy, midstream portions of highly variable streams and rivers. (Authors)

13069. Basedow, Thies (Kiel Univ., West Germany). 1969. EFFECT OF TEMPERATURE SHOCK ON THE TEMPERATURE RESISTANCE OF POIKILOTHERM AQUATIC ANIMALS. EXPERIMENTS ON THE PROBLEM OF HEAT AND COLD-HARDENING IN ANIMALS (GERMAN). Internationale Revue der Gesamten Hydrobiologie, 54(5): 765-789, in German with English summary; Selected Water Resources Abstracts, 3(22): p. 44.

After a sublethal heat shock the heat resistance of the fishes Idus idus and Xiphophorus helleri and the newt Triturus vulgaris undergoes a slight but statistically significant increase for a short time. The heat resistance of Idus idus equally rises after more moderate, but longer lasting heat shocks. After a shock-transfer and maintenance in extremely high temperatures the three fish-species examined do not show a "heat-hardening" discernible from the heat-adaptation. Sublethal heat shock and shock-transfer in extremely high temperatures have the same effect on the heat resistance of Idus idus. In the biological range of temperature of Idus idus and Anguilla vulgaris the rate of heat-adaptation increases with temperature. The results on the three invertebrates examined, Dinophilus gyrociliatus, Dreissena polymorpha, and Laomedea loveni, do not make necessary a distinction between a heat-hardening and a heat-adaptation. The problem of hardening is discussed in several aspects. The results can be interpreted as a resistance adaptation. -- Sjolseth.

13070. Hughes, Janice S., and James T. Davis (Louisiana Wild Life and Fisheries Comm., Louisiana). 1962. TOXICITY OF SELECTED HERBICIDES TO BLUEGILL SUNFISH. Proc. of Louisiana Acad. of Sci., Vol. 25, pp. 86-93; Selected Water Resources Abstracts, 3(22): p. 44.

Bioassays were conducted to determine the toxicity of 14 herbicides to bluegill sunfish. Twenty-four and forty-eight hour TLm's were calculated for endothal, TD-191, TD-47, TD-266, diphenamid, emid, fenac, dichlobenil, CIPC, dalapon, diquat, amitrole, sterox and stull invert oil. -- Sjolseth

13071. Nagasawa, Sumio, Shoji Asano, and Kazunobu Kondo (Ihara Agric. Chemicals Inst., Shimizu, Japan). 1964. AN ANALYTICAL METHOD FOR EVALUATING THE SUSCEPTIBILITY OF FISH SPECIES TO AN AGRICULTURAL CHEMICAL (JAPANESE). Japanese Jl. of Applied Entomology and Zoology, 8(2): 118-122, (English summary); Selected Water Resources Abstracts, 3(22): p. 38.

If the variance of size of test organisms used in the biological assay experiment of chemicals is large, the dosage applied must be corrected corresponding to their size. 'Size factor' for equalizing individual differences in body weight can be calculated by the multiple regression equation. The survival time after immersion was determined as the function of dosage and body weight. Based on this idea, a comparative test on susceptibility to E1-43, 064 between the goldfish and 'Dojo' fish was made by dipping method. The result has shown that the 'Dojo' fish is 5.32 times as susceptible as the goldfish to E1-43, 064. -- Sjolseth

13072. Dodgen, Charles L., and Sue Sullivan (Dept. of Biochemistry, Mississippi Univ., Jackson, Mississippi). 1969. HEMATOLOGICAL EFFECTS OF APHOLATE ON CHANNEL CATFISH (Ictalurus punctatus). Proc. Soc. for Exp. Bio. and Medicine, Vol. 131, pp. 124-126; Selected Water Resources Abstracts, 3(24): p. 32.

Channel catfish fingerlings were given oral doses of apholate, 200 mg/kg and 400 mg (Apholate/kg body weight), an alkylating agent. Total erythrocyte, total leukocyte, and differential leukocyte counts were made to determine hematological changes produced by apholate. The changes in erythrocyte counts of animals receiving apholate at both levels were not significantly different from the control. The total leukocyte counts were significantly lower in the treated fish. There was less of an effect upon the thrombocytes. The lower dose used in the experiments approximates the LD50 of 191 mg/kg, determined at 14 days post-treatment. The LD50 decreases to 124 mg/kg at 30 days, but no deaths occurred in less than 8 days, regardless of dose. -- Katz

13073. Tucker, Thomas R., and Stephen H. Taub (Ohio Coop. Fish. Unit, the Ohio State Univ., Columbus, Ohio). 1970. AGE AND GROWTH OF THE WALLEYE, Stizostedion vitreum vitreum, IN HOOVER RESERVOIR, OHIO. The Ohio Journal of Science, 70(5): 314-318.

A total of 527 walleyes was studied from trap-net collections made in March-April, 1967, in Hoover Reservoir, Ohio. The age and growth-structure analysis of this population showed that age group II walleyes (1965 year class) were predominant in the catch. Few walleyes older than age group V were captured. The greatest growth increment was attained during the first year of life. In comparison with walleyes studied elsewhere, Hoover Reservoir walleyes grew rapidly until their fifth year of life, followed by a decline in growth rate. Few large walleyes were present in the Hoover Reservoir population at the time of this study. (Authors)

13074. Stevens, Donald E., and Lee W. Miller (Calif. Dept. of Fish and Game, Sacramento, California). 1970. DISTRIBUTION OF STURGEON LARVAE IN THE SACRAMENTO - SAN JOAQUIN RIVER SYSTEM. Calif. Fish Game, 56(2): 80-86.

Yolk sac stage white sturgeon, Acipenser transmontanus, and/or green sturgeon, A. medirostris, were collected from the Sacramento - San Joaquin river system, California, during the spring in 1966, 1967, and 1968. Total catch ranged from 9 sturgeon in 1966 to 76 sturgeon in 1967. The larvae were captured from the Sacramento - San Joaquin Delta and from the Sacramento River. Numbers of larvae collected in the Delta were related to the amount of flow into the Delta. This suggests that virtually all spawning occurred upstream. Water temperature ranged from 14 to 22 C when the larvae were caught. Catches by nets set at different depths gave evidence that the larvae are demersal. (Authors)

13075. Cordone, Almo J., and Stephen J. Nicola (Calif. Dept. of Fish and Game, Sacramento, California). 1970. INFLUENCE OF MOLYBDENUM ON THE TROUT AND TROUT FISHING OF CASTLE LAKE. Calif. Fish Game, 56(2): 96-108.

The addition of 35 lb of sodium molybdate ($Na_2 Mo4 \cdot 2H_2 O$) to Castle Lake, California, in July 1963 was followed by record yields to the angler of rainbow trout (Salmo gairdnerii) in 1966, and eastern brook trout (Salvelinus fontinalis) in 1967. The increase each year was approximately 3.5 lb per acre greater than the average annual yield for the period 1960-1965. Estimated cost per additional pound of trout in the creel was less than $0.10. High survival of the 1965 year class of both species was responsible for the increased yeild. Greater standing crops of zooplankton and bottom fauna very likely promoted the improved survival. Changes in growth rates of trout following fertilization were not significant. The strong 1965 year classes apparently reduced survival of subsequent year classes. Factors other than fertilization may have influenced the high survival of the 1965 year classes. These include (1) the size and condition of rainbow trout when stocked, (2) the density of resident rainbow trout when a plant was made, and (3) a record December 1964 flood. Because of the doubts created by these factors, a second experimental molybdenum addition has been made. (Authors)

13076. Swift, Michael C. (Univ. of Calif., Davis, California). 1970. A QUALITATIVE AND QUANTITATIVE STUDY OF TROUT FOOD IN CASTLE LAKE, CALIFORNIA. Calif. Fish Game 56(2): 109-120.

Trout in Castle Lake were studied, using stomach content analysis and calorimetry, to delineate their diets and energy supply. A qualitative difference exists between foods of the eastern brook trout, Salvelinus fontinalis, and rainbow trout, Salmo gairdnerii, with the brook trout feeding primarily on benthic organisms and the rainbow trout feeding primarily on terrestrial organisms. Zooplankton is eaten equally by both species. Based on the energy content of the food items and their proportions in the diet, 40% of the total energy consumed by the trout is benthic in origin, about 10% is pelagic, and about 50% is terrestrial. (Auth.)

13077. Hazel, Charles R., and Stephen J. Meith (Calif. Dept. of Fish and Game, Sacramento, California). 1970. BIOASSAY OF KING SALMON EGGS AND SAC FRY IN COPPER SOLUTIONS. Calif. Fish Game, 56(2): 121-124.

Flowing water bioassay of king (chinook) salmon (Oncorhynchus tshawytscha) eggs and fry in a copper solution indicated that eggs are more resistant to the toxic effects of copper than fry. Copper concentrations of 0.08 mg/liter did not noticeably affect the hatching success of eyed eggs, but concentrations as great as 0.04 mg/liter were acutely toxic to fry and concentrations of 0.02 mg/liter caused increased mortality and inhibited growth. (Authors)

13078. Pearcy, William G. (Oregon State Univ., Corvallis, Oregon). 1970. VERTICAL MIGRATION OF THE OCEAN SHRIMP, Pandalus jordani: A FEEDING AND DISPERSAL MECHANISM. Calif.Fish Game, 56(2): 125-129.

Ocean shrimp, mainly immature males, were common in nighttime midwater trawl collections off Oregon. They were captured every month of the year except May and June. Annual catches varied greatly at the same stations during 7 years. Shrimp caught in midwater at night were foraging on euphausiids and copepods. The stomachs of shrimp caught in bottom trawls, on the other hand, contained benthos, but no identifiable pelagic animals. Besides being related to feeding behavior, vertical migration may enhance dispersal of shrimp. (Auth.)

13079. Stauffer, Thomas M. 1970. FECUNDITY OF COHO SALMON FROM LAKE MICHIGAN. Mich. Dept. of Natural Resources Research and Development Report No. 212, 15 p.

Eggs from 17 mature coho salmon (Oncorhynchus kisutch) that were taken in October 1969 from the Platte River, a Lake Michigan tributary, were counted and their diameter measured. The presumed origin of these salmon was a plant of yearling coho in the Platte River in the spring of 1968. The yearlings had been obtained as eyed eggs from the Columbia River. Number and average diameter of eggs in Platte River salmon ranged from 2,229 and 0.27 inch in a 21.6-inch salmon to 3,812 and 0.31 inch in a 30.8-inch salmon. Egg number was positively correlated with salmon length ($r = 0.80$) and weight ($r = 0.80$). The regressions were: egg number = 172 total length (inches) - 1,486, and egg number = 195 weight (pounds) + 1,594. Egg diameter was positively correlated ($r = 0.91$) with fish length. The regression was: egg diameter = .00542 fish length (inches) + 0.146. Lake Michigan coho salmon produced more eggs than West Coast coho salmon of comparable lengths. Thirty-three dead coho salmon from the Platte River were examined for egg retention; 27% retained 80% or more of their eggs. This was considerably greater than that recorded for West Coast coho salmon. (Auth.)

13080. Inland Fisheries Branch, Calif. Dept. of Fish and Game. 1970. EFFECTS OF ARTIFICIAL DESTRATIFICATION ON DISTRIBUTION OF BOTTOM ORGANISMS IN EL CAPITAN RESERVOIR. State of Calif. Resources Agency, Dept. of Fish and Game Fish Bull. 148, 30 p.

The bottom fauna of El Capitan Reservoir, San Diego County, California, was sampled during 1964, under normal conditions, which included prolonged stratification. The lake was then destratified artificially for 2 years. The benthic organisms, including midge larvae and pupae, oligochaete worms, nematode worms, and freshwater clams, rapidly invaded the profundal zone. They had previously been absent there in summer. Their total numbers in the lake increased dramatically. A combination of anoxia and toxic conditions in the hypolimnion had presumably excluded them from the deeper parts of the lake when it was stratified. In 1967 the lake was permitted to stratify again. By August the normal summer distributional pattern of bottom organisms was beginning to reappear. Extending the distribution of midges throughout the lake by artificial destratification should increase the amount of food available to game fish. This is not so with oligochaetes, clams, and nematodes, which do not usually enter the food chains culminating in game fish. The long-term implications of artificial destratification for reservoir fishery management are discussed. (Authors)

13081. FAO of the United Nations (Rome, Italy). 1970. REPORT OF THE MAN-MADE LAKES STOCK ASSESSMENT WORKING GROUP JINJA, UGANDA, 11-16 MAY, 1970. FAO Fisheries Reports, No. 87, 13 p.

Africa. Fisheries resources and exploitation. Stock assessment - present state of investigations - survey programmes, methods. Basic data on lakes, catch statistics.

13082. Dendy, J. S. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1966. TESTING PLANT MATERIALS FOR DETECTION OF OXYGEN-DEFICIENT WATER IN PONDS. Proc. of FAO World Symposium on Warm-water Pond Fish Culture, Rome, Italy, 18-25 May 1966: FAO Fish. Rep. 44(4): 475-479.

An easy method of determining the extent of oxygen deficiency in ponds, using the staining qualities of plant materials, is described. Woods, barks, leaves and fruits of many kinds of plants stain dark in pond water that contains less than approximately 0.2 ppm dissolved oxygen, whereas they do not stain in well-aerated water. Stain results from the reaction of ferrous iron in the water with tannic acid in plant materials. Suitable woods stained within 10 to 15 minutes in laboratory tests, and within 30 to 45 minutes in pond tests. Both fresh and dried materials stained in oxygen-deficient pond water. (Auth.)

13083. Edwards, Peter. 1970. ILLUSTRATED GUIDE TO THE SEAWEEDS AND SEA GRASSES IN THE VICINITY OF PORT ARANSAS, TEXAS. Contributions in Marine Science, Univ. of Texas Marine Science Inst., Port Aransas, Texas, Supplement to Vol. 15, 128 p.

13084. Espinosa, F. A., Jr., James E. Deacon, and Andre Simmons (Dept. of Biol. Sci., Univ. of Nevada, Las Vegas, Nevada). 1970. AN ECONOMIC AND BIOSTATISTICAL ANALYSIS OF THE BAITFISH INDUSTRY IN THE LOWER COLORADO RIVER. Univ. of Nevada Special Publication, 87 p.

13085. Mounib, M. S. (Fish. Res. Bd. of Canada, Halifax Lab., Endocrinology Section, Halifax, Nova Scotia, Canada). 1967. METABOLISM OF PYRUVATE IN TESTES OF FISH AND RABBITS WITH PARTICULAR REFERENCE TO P-NITROPHENOL AND 2, 4-DINITROPHENOL. Comp. Biochem. Physiol., 22: 539-548; 1967 Studies, Fish. Res. Bd. Canada, Part 2, FRB Studies No. 1173, pp. 339-348, 1968.

In the testes of fish and of rabbits pyruvate undergoes reduction to lactate, an oxidative decarboxylation, and a fixation with carbon dioxide. The oxidative decarboxylation of pyruvate, and the CO_2-fixation with pyruvate, may play a role in regulating the metabolism in the testis. In the cod testicular tissue all carbons of pyruvate could incorporate into lipids, proteins and nucleic acids. The testicular tissue of the two species responded differently to nitrophenols at a concentration of 10^{-4} M, whereas at a higher concentration ($2\text{-}4 \times 10^{-4}$ M) the oxidative metabolism was suppressed in the two species. (Auth.)

13086. Bell, Gordon R. (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1966. ON THE MICROBIAL FLORA OF STREAM-INCUBATED EGGS OF THE PACIFIC SALMON (Oncorhynchus). Bull. Office Intern. Epizooties, 65(5-6): 769-776; 1967 Studies, Fish. Res. Bd. Canada, Part 2, FRB Studies No. 1165, pp. 281-288, 1968.

The purpose of this study is to assess the role of microorganisms in causing mortalities of naturally incubating eggs of the Pacific salmon. The investigation has been initiated by an ecological study of microorganisms populating the immediate environment of the egg. Results suggest that living eggs have a characteristic flora and the enzymatic activities of bacterial isolates are such that these bacteria could adversely affect the egg structure. (Auth. summ.)

13087. Tibbo, S. N. (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1965. EFFECT OF LIGHT ON MOVEMENTS OF HERRING IN THE BAY OF FUNDY. Intern. Comm. Northwest Atlantic Fish., Spec. Publ.

No. 6, pp. 579-582; 1967 Studies, Fish. Res. Bd. Canada, Part 2, FRB Studies No. 1150, pp. 113-116, 1968.

Crude laboratory experiments indicate that young herring (Clupea harengus L.) 10-15 cm long are attracted to the surface by incident light intensities which do not exceed 15-16 m-c and that the speed of attraction varies inversely with the light intensity. Sonic-sounder recordings in depths of 7-22 m show that "sardine" herring lie on or very close to the bottom on sunny, winter afternoons. At twilight they rise from the bottom in dense shoals and after dark become widely dispersed in the upper water layers. (Auth.)

13088. Freeman, H. C., and D. R. Idler (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1966. TRANSCORTIN BINDING OF CORTISOL IN ATLANTIC SALMON (Salmo salar) PLASMA. General and Comp. Endocrinology, 7(1): 37-43; 1967 Studies, Fish. Res. Bd. Canada, Part 1, FRB Studies No. 1116, pp. 49-55, 1967.

Cortisol binding by female Atlantic salmon plasma was studied with both a gel filtration and a double equilibrium dialysis technique. The plasma was found to contain a heat-labile transcortin-type protein, but the plasma had a binding capacity for cortisol averaging only about 6% of that reported for human plasma. Binding as a function of cortisol concentration and sensitivity of the binding protein to temperature change are compared with data given in the literature for transcortin in mammals. Cortisol binding in salmon plasma was found to be less sensitive to temperature and cortisol concentration than binding by human transcortin. It seems likely that the capacity of this protein is insufficient to protect the salmon from any adverse effects of hypercorticism even when plasma cortisol is only slightly elevated. Transcortin binding in cod was comparable to that in salmon. (Authors)

13089. Mounib, M. S. (Fish. Res. Bd. of Canada, Halifax Lab., Endocrinology Section, Halifax, Nova Scotia, Canada). 1967. METABOLISM OF PYRUVATE BY THE OVARIAN TISSUE OF COD. Exp. Cell Res., 46: 610-612; 1967 Studies, Fish. Res. Bd. of Canada, Part 2, FRB Studies No. 1174, pp. 349-351, 1968.

Previous work from this laboratory has shown that pyruvate, when added to the incubation medium of the testicular tissue of cod or rabbit, undergoes: (1) reduction to lactate, and (2) oxidative decarboxylation. This communication presents evidence that the ovarian tissue of cod metabolizes pyruvate essentially via the same routes.

13090. Rogers, Wilmer A. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1967. Myzotrema cyclepti gen. n., sp. n. (TREMATODA: MONOGENEA) FROM GILLS OF Cycleptus elongatus (LeSueur) FROM ALABAMA. Proc. of Helm. Soc. Wash., 34(1): 3-6, illus.

13091. Jamsen, G. C., J. R. Ryckman, and F. W. Jamsen. 1970. MICHIGAN'S 1969 SALMON AND TROUT SPORT FISHERY. Michigan Dept. of Natural Resources Research and Development Report No. 203, 10 p. and appendices.

13092. Dept. of the Interior, Bur. of Sport Fish. and Wildl. 1970. PUBLICATIONS OF THE BUREAU OF SPORT FISHERIES AND WILDLIFE IN SEPTEMBER AND OCTOBER 1970. U. S. Dept. of Interior, Bur. of Sport Fisheries and Wildlife, 4 p.

13093. Rogers, Wilmer A. (Agric. Exp. Sta., Auburn Univ., Auburn, Alabama). 1967. STUDIES ON DACTYLOGYRINAE (MONOGENEA) WITH DESCRIPTIONS OF 24 NEW SPECIES OF Dactylogyrus, 5 NEW SPECIES OF Pellucidhaptor, AND THE PROPOSAL OF Aplodiscus gen. n. J. Parasit., 53(3): 501-524.

13094. Kirpichnikov, V. S. (Editor). 1970. SELECTIVE BREEDING OF CARP AND INTENSIFICATION OF FISH BREEDING IN PONDS. (Selektsiya karpa i voprosy intensifikatsii prudovogo rybovodstva). Bull. of the State Scientific Research Inst. of Lake and River Fisheries, Vol. 61, 249 p., published for the U. S. Dept. of Interior and National Sci. Foundation, Wash., D. C. by the Israel Program for Scientific Translations, available from the U. S. Dept. of Commerce, Clearinghouse for Fed. Sci. and Tech. Information, Springfield, Va.

Part One. Selective Breeding of Carp: goals and methods in carp selection; characterization of spawners of the major breeds of carp in the USSR; methods of progeny testing spawners in carp fish farms; heterosis in intraspecific crossings of carp; the influence of stocking density on the growth, variability, and survival rate of young hybrid carp; evolution of scale cover in cultivated carp; the ecological physiology and biochemistry of carp, "Eastern Carp", and their hybrids; heritability of some morphological (diagnostic) traits in Ropsha carp; morphological traits of hybrids of carp (Cyprinus carpio L.) and tench (Tinca tinca L.); preliminary results and further tasks of the organization of selective breeding in the northwestern RSFSR; selective breeding of northern hybrid carp in the Novgorod region; selective breeding of northern hybrid carp in the Pskov region; evaluation of the fishery qualities of northern hybrid carp in fish farms of the Pskov region. Part Two. Intensification of Fish Breeding in Ponds: an artificial method for producing commercial fish larvae; transportation and final incubation of artificially fertilized carp eggs; nutrition of northern ("Ropsha") carp hybrid fingerlings at various densities and temperatures in ponds; a case of dropsy in grass carp; the effect of diet on the number of oocysts of coccidia (Eimeria carpelli) in carp; increasing the fish productivity of ponds in Belorussia; development of fish breeding in ponds in Western Siberia.

13095. McCauley, R. W., and J. S. Tait (Dept. of Biol., Waterloo Lutheran Univ., Waterloo, Ontario, Canada). 1970. PREFERRED TEMPERATURE OF YEARLING LAKE TROUT, Salvelinus namaycush. J. Fish. Res. Bd. Canada, 27(10): 1729-1733.

Preferred temperatures were determined for yearling lake trout acclimated to 5, 10, 15, and 20 C. Acclimation temperature had virtually no effect on preferred temperature. The final preferendum was 11.7C, which is about 2 degrees C warmer than the temperature at which lake trout are most commonly caught in thermally stratified lakes. (Authors)

13096. Manion, Patrick J., and Thomas M. Stauffer (Bur. of Comm. Fish., Biol. Sta., Marquette, Michigan). 1970. METAMORPHOSIS OF THE LANDLOCKED SEA LAMPREY, Petromyzon marinus. J. Fish. Res. Bd. Canada, 27(10): 1735-1746.

The external metamorphosis of the sea lamprey was divided into four stages, based primarily on the condition of the mouth: mouth reduced, mouth fused, mouth enclosed, and mouth elongated. During metamorphosis, the eye enlarged greatly, the snout and mouth region changed from a fleshy hood enclosing a sieve apparatus to a large sucking disc, the nasopore membrane and the branchial area shrank, the branchipores changed in shape, the general color changed from dark brown and yellow to an intense blue-black dorsally and white ventrally, and the total length increased. Metamorphosis began in early to mid-July and did not take place after August. The duration of external metamorphosis was about 3 months for lampreys transforming under natural conditions. The mean lengths of metamorphosing lampreys from tributaries of lakes Superior and Michigan were 145 and 136 mm, respectively. (Authors)

13097. Westrheim, S. J. (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1970. SURVEY OF ROCKFISHES, ESPECIALLY PACIFIC OCEAN PERCH, IN THE NORTHEAST PACIFIC OCEAN, 1963-66. J. Fish. Res. Bd. Canada, 27(10): 1781-1809.

13098. Pivnicka, Karel (Lab. of Ichthyology, Dept. of Zoology, Charles Univ., Prague, Czechoslovakia). 1970. MORPHOLOGICAL VARIATION IN THE BURBOT (Lota lota) AND RECOGNITION OF THE SUBSPECIES: A REVIEW. J. Fish. Res. Bd. Canada, 27(10): 1757-1765.

A review of the morphometric and meristic variations in 893 specimens of the burbot (Lota lota) from 18 freshwater areas representing the range of the species, showed that Lota lota lacustris (= maculosa), with a short high caudal peduncle and low meristic values may be distinguished from Lota lota lota, with a long low caudal peduncle and high meristic values. Lota l. lota occurs from the Volga River system through Siberia and Alaska to the Mackenzie River system in Canada. The populations from the Elbe River and the Danube River are on the periphery of this subspecies, to which it clearly belongs. Lota l. lacustris occurs in southernmost Canada, the United States, and western Europe. Both Lota l. leptura (Hubbs and Schultz, 1941) and Lota l. kamensis (Markun, 1936) are synonyms of Lota l. lota (Linnaeus, 1758). Clinal variations in the means for various characters of the species were found as follows. All meristic values and length of the caudal peduncle as a percentage of standard body length, in general, increased eastward from western Europe as far as 120°E and then decreased toward New England. Predorsal and preanal lengths generally increased eastward from western Europe to New England. The following generally decreased from western Europe eastward to 120°E and then increased toward New England: head length, interorbital width, postpectoral length, and depth of caudal peduncle as a percentage of standard length; depth of caudal peduncle as a percentage of its length; and postpectoral length as a percentage of predorsal length. (Auth.)

13099. Brett, J. R., and D. A. Higgs (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1970. EFFECT OF TEMPERATURE ON THE RATE OF GASTRIC DIGESTION IN FINGERLING SOCKEYE SALMON, Oncorhynchus nerka. J. Fish. Res. Bd. Canada, 27(10): 1767-1779.

By means of serial slaughter the rate of gastric digestion in yearling sockeye salmon (30-40 g) was studied at approximately 3, 5, 10, 15, 20, and 23 C, after satiation feeding on Abernathy pellets. Subsequently the ash-free dry weight of the stomach contents was determined and expressed as a fraction of the dry weight of the fish. At any one temperature, rate of digestion appeared to be proportional to the mass of food remaining in the stomach (exponential decline). The time for complete digestion decreased from 147 hr at 3 C to 18 hr at 23 C. The time for one-half of a sample of fish to exhibit empty stomachs corresponded closely to that for a mean state of 96% gastric digestion, providing a simple means for determining rate of digestion. (Authors)

13100. McRoy, C. Peter (Inst. of Marine Sci., Univ. of Alaska, College, Alaska). 1970. STANDING STOCKS AND OTHER FEATURES OF EELGRASS (Zostera marina) POPULATIONS ON THE COAST OF ALASKA. J. Fish. Res. Bd. Canada, 27(10): 1811-1821.

Of eelgrass populations sampled from southeast Alaska to Bering Strait, those in Kinzarof and Izembek lagoons on the Alaska Peninsula had the highest standing stocks (mean, 1510 g dry wt/m^2) and that in Calder Bay in southeast Alaska had the lowest (65 g dry wt/m^2). Caloric content of eelgrass averaged 4211 cal/g in the leaves and 3571 cal/g in the roots and rhizomes. The concentration of chlorophyll in eelgrass had a mean of 0.513 mg/g fresh wt, with one exception. Population densities were high in Kinzarof and Izembek lagoons (mean, 4576 turions/m^2) and low in all other sample areas (599 turions/m^2). Flowering plants were 3-4% of the total population. Mean leaf length varied from 13 to 48 cm and width from 2.4 to 5.1 mm. The differences in the eelgrass populations appeared to be related to local conditions rather than a large geographical gradient. (Auth.)

13101. MacCallum, Wayne R., and Henry A. Regier (Dept. of Zoology, Univ. of Toronto, Toronto, Ontario, Canada). 1970. DISTRIBUTION OF SMELT, Osmerus mordax, AND THE SMELT FISHERY IN LAKE ERIE IN THE EARLY 1960'S. J. Fish. Res. Bd. Canada, 27(10): 1823-1846.

Young-of-the-year smelt inhabited the inshore waters in the spring. By late

fall they were dispersed throughout the eastern two-thirds of the lake, with greater concentrations around Long Point. Yearlings, dispersed throughout the lake in the early spring, appeared to move into shallower waters after the spawning period. Many yearlings were caught in the eastern basin in waters of 15 C. Yearlings in the central basin concentrated in its southeast corner by the middle of June, and many occurred in the sharp themocline even though oxygen concentrations were adequate below it. In winter and early spring, the adult population was dispersed throughout the lake except in the western half of the western basin. Spawning runs usually began by the middle of April at Point Pelee and reached the eastern basin about 2 weeks later. Almost all spawning occurred on the north shore of the lake. Offshore movements and dispersal of the adults followed spawning. The hypolimnion of the central basin became deoxygenated in summer and then the majority of the yearlings and adults were to be found in the thermocline. The pattern of commercial fishing catches indicated a concentration of commercially desirable smelt in the Long Point Bay area from about September to the following spring. The average yearly production of 75 kg/ha from a 518 km^2 area of Long Point Bay for the years 1961-65 suggests a net movement (in terms of biomass) of smelt into that area. (Authors)

13102. Gee, J. H. (Dept. of Zoology, Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1970. ADJUSTMENT OF BUOYANCY IN BLACKNOSE DACE, Rhinichthys atratulus. J. Fish. Res. Bd. Canada, 27(10): 1855-1859.

The stream-dwelling blacknose dace (Rhinichthys atratulus) required 84 hr to adjust from moderately negative to neutral buoyancy when transferred from running to still water, and 132 hr to adjust from neutral to moderately negative buoyancy when transferred from still to running water. This adjustment was achieved partly by loss or addition of swimbladder gases and partly by altering the pressure of gases within the swimbladder, and accompanied slight changes in swimbladder length. (Auth.)

13103. Davis, John C. (Dept. of Zoology, Univ. of Brit. Columbia, Vancouver, Brit. Columbia, Canada). 1970. ESTIMATION OF CIRCULATION TIME IN RAINBOW TROUT, Salmo gairdneri. J. Fish. Res. Bd. Canada, 27(10): 1860-1863.

Circulation time in rainbow trout, Salmo gairdneri (mean weight 211.9 g) at 10 C was estimated by injecting Cardio-Green dye into the dorsal aorta and timing its reappearance at the site of injection. Circulation times ranged from 48 to 96 sec in the nine fish studied and had a mean value of 64.1 $\pm$ 16.4 sec. These circulation times are consistent with the known blood volume and cardiac output for rainbow trout. Such circulation times provide useful information on the theoretical positioning of receptors for the regulation of circulation and ventilation. Responses of trout to hypoxia or reduced gill water flow are too rapid to be initiated solely by a venous receptor considering these circulation times. Receptor sites must therefore be located in the arterial system or on the gills themselves. (Auth.)

13104. Hamilton, Andrew L., William Burton, and John F. Flannagan (Fish. Res. Bd. of Canada, Freshwater Inst., Winnipeg, Manitoba, Canada). 1970. A MULTIPLE CORER FOR SAMPLING PROFUNDAL BENTHOS. J. Fish. Res. Bd. Canada, 27(10): 1867-1869.

A multiple corer for sampling the benthos of profundal sediments is described. This sampler is relatively simple to construct and is light (approximately 17.5 lb (7.9 kg) and easy to use. Four core samples are taken simultaneously and trials reported elsewhere indicate that in soft sediments the samples taken are generally superior to those collected with most, if not all, of the more conventional samplers tested. (Authors)

13105. Brownell, Willard N. (Dept. of Conservation, Cornell Univ., Ithaca, New York). 1970. COMPARISON OF Mysis relicta AND Pontoporeia affinis AS POSSIBLE INTERMEDIATE HOSTS FOR THE ACANTHOCEPHALAN Echinorhynchus salmonis. J. Fish. Res. Bd. Canada, 27(10): 1864-1866.

Pontoporeia affinis (a known vector of Echinorhynchus salmonis) and Mysis relicta from Cayuga Lake were fed to yearling lake trout to determine if the parasite would be introduced into the fish. Pontoporeia is definitely a carrier of E. salmonis larvae; Mysis apparently is not. (Auth.)

13106. Lane, Charles E., and Edward D. Scura (Rosenstiel School of Marine and Atmospheric Sciences, Univ. of Miami, Miami, Florida). 1970. EFFECTS OF DIELDRIN ON GLUTAMIC OXALOACETIC TRANSAMINASE IN Poecilia latipinna. J. Fish. Res. Bd. Canada, 27(10): 1869-1871.

Serum glutamic oxaloacetic transaminase activity in the sailfin mollie, Poecilia latipinna, increased significantly in fish exposed to the pesticide dieldrin. All test fish were killed within 72 hr in 0.012 ppm. (Authors)

13107. Case, Brian (Dept. of Zoology, Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1970. SPAWNING BEHAVIOUR OF THE CHESTNUT LAMPREY (Ichthyomyzon castaneus). J. Fish. Res. Bd. Canada, 27(10): 1872-1874.

Spawning behaviour of the chestnut lamprey, Ichthyomyzon castaneus, was observed June 11 and 12, 1968, in coarse gravel near the tailrace of a dam in the Rat River, Manitoba, a tributary of the Red River. No description of spawning behaviour of this species has been previously published. (Auth.)

13108. Chenoweth, Stanley B. (Bur. of Comm. Fish., Biol. Lab., West Boothbay Harbor, Maine). 1970. SEASONAL VARIATIONS IN CONDITION OF LARVAL HERRING IN BOOTHBAY AREA OF THE MAINE COAST. J. Fish. Res. Bd. Canada, 27(10): 1875-1879.

The relative condition values for larval herring (Clupea harengus harengus L.) in the Boothbay area of the Maine coast were lowest in winter: in February in 1965, 1966, and 1967 and in January in 1968. Low water temperatures and a scarcity of food are suggested as reasons for the poor condition. Larval condition showed the greatest variation in 1964-65, and in February 1965 reached the lowest point for the 4 years. The evidence suggests that larval mortality was unusually high during that winter. (Auth.)

13109. McKim, J. M., G. M. Christensen, and Evelyn P. Hunt (Fed. Water Quality Admn, National Water Qual. Lab., Duluth, Minnesota). 1970. CHANGES IN THE BLOOD OF BROOK TROUT (Salvelinus fontinalis) AFTER SHORT-TERM AND LONG-TERM EXPOSURE TO COPPER. J. Fish. Res. Bd. Canada, 27(10): 1883-1889.

Seven blood characteristics - red blood cell count (RBC), hematocrit (Hc), hemoglobin (Hb), plasma chloride (Cl), plasma glutamic oxalacetic transaminase (PGOT, L-aspartate:2-oxoglutarate amino transferase); osmolarity (Os), and total protein (TP) - were measured in brook trout (Salvelinus fontinalis) that had been exposed to three concentrations (67.5-69.2, 38.2-39.0, and 22.8-24.0 μg/liter) of Cu(II) for 6 and 21 days. Concentrations of 67.5-69.2 and 38.2-39.0 μg/liter caused statistically significant increases in RBC, Hc (6-day only), Hb, PGOT, and TP (6-day only), whereas Cl and Os decreased during both exposure periods. Five blood characteristics (RBC, Hb, Hc, Cl, and PGOT) were also measured in brook trout, which were exposed for 337 days to Cu(II) concentrations of 32.5, 17.4, 9.5, 5.7, and 3.4 μg/liter. After this long-term exposure, no changes were observed in the blood except for a measurable decrease in PGOT values at 32.5 and 17.4 μg/liter. The disappearance of initial blood changes, after extended exposure, suggests the transient nature of these early responses. Application of this study to the evaluation of the physical condition of fish and the possible long-range forecasting of reproductive success and survival of a species is discussed. (Authors)

13110. Smith, R. J. F. (Dept. of Biol., Univ. of Saskatchewan, Saskatoon, Saskatchewan). 1970. A TECHNIQUE FOR MARKING SMALL FISH WITH INJECTED FLUORESCENT DYES. J. Fish. Res. Bd. Canada, 27(10): 1889-1891.

Individual fish or small groups of fish can be marked by injecting small

amounts of fluorescent dye under the skin. This method caused no apparent injury to stickleback or to a fathead minnow. The marks produced were still visible after 8-11 months. (Auth.)

13111. Threlfall, William, and George Hanek (Dept. of Biol., Memorial Univ. of Newfoundland, St. John's, Newfoundland, Canada). 1970. METAZOAN PARASITES OF SALMONIDS AND COREGONIDS FROM THE AVALON PENINSULA, NEWFOUNDLAND. J. Fish. Res. Bd. Canada, 27(10): 1894-1897.

Sixty-seven salmonids and coregonids (32 Salvelinus fontinalis, 3 Salmo salar, 22 Salmo trutta, 10 Coregonus clupeaformis), caught at various locations on the Avalon Peninsula, Newfoundland, were examined for metazoan parasites, during the period November 15, 1968-June 12, 1969. Eight genera of helminths (two of Monogenea, three of Digenea, one each of Cestoda, Namatoda, Acanthocephala) and one of parasitic copepods (Ergasilus) were recovered. This number includes one new host record and two new host records for Newfoundland. (Authors)

13112. Zaugg, W. S., and L. R. McLain (Western Fish Nutrition Lab., Bur. of Sport Fish. and Wildl., Cook, Washington). 1970. ADENOSINETRIPHOSPHATASE ACTIVITY IN GILLS OF SALMONIDS: SEASONAL VARIATIONS AND SALT WATER INFLUENCE ON COHO SALMON, Oncorhynchus kisutch. Comp. Biochem. Physiol., Vol. 35, pp. 587-596.

ATPase activities in gills of yearling coho salmon were monitored from February to October. Na^+, K^+-activated ATPase activity increased during the last 2 weeks of March and remained constant until July, when a decrease was observed. Na^+, K^+-activated ATPase began to increase 3 to 4 days after coho salmon were placed in salt water and continued to increase for 30 to 35 days. Mg^{2+}-dependent ATPase decreased during this same period of time. Dietary sodium chloride caused an increase in Na^+, K^+-ATPase and a decrease in Mg^{2+}-dependent ATPase activity. (Authors)

13113. Mounib, M. S., and J. S. Eisan (Fish. Res. Bd. of Canada, Halifax Lab., Halifax, Nova Scotia, Canada). 1968. CARBON DIOXIDE FIXATION BY SPERMATOZOA OF COD. Comp. Biochem. Physiol., 25: 703-709; 1968 Studies, Part 2, Fish. Res. Bd. Canada, FRB Studies No. 1237, pp. 25-31, 1968.

Sperm of cod, in the presence of $^{14}CO_2$, incorporated label into keto-, amino and other organic acids, lipids, proteins and nucleic acids. Pyruvate enhanced $^{14}CO_2$ incorporation into the supernatant of the incubation mixture, whereas malonate depressed it. Extracts of frozen sperm and their acetone powder showed activity of malic enzyme, and of phosphoenolpyruvate and propionyl CoA carboxylases. (Authors)

13114. Ingles, C. J., J. R. Trevithick, M. Smith, and G. H. Dixon (Dept. of Biochem., Fac. of Med., Univ. of Brit. Columbia, Canada). 1966. BIOSYNTHESIS OF PROTAMINE DURING SPERMATOGENESIS IN SALMONOID FISH. Biochem. Biophys. Res. Commun., 22(6): 627-634; 1968 Studies, Part 2, Fish. Res. Bd. Canada, FRB Studies No. 1245, pp. 105-112, 1968.

In the experiments described here, the biosynthesis of protamine has been examined in developing salmonoid testes. Spermatogenesis was induced in immature Steelhead trout (Salmo gairdnerii) by injection of salmon (Oncorhynchus) pituitary extracts to provide a continuing source of experimental material. Using cell suspensions from these testes and also from those in naturally maturing Pacific salmon, active incorporation of arginine-H^3 into protamine has been observed. The effects of the inhibitors cycloheximide, puromycin and chloramphenicol indicate that protamine, despite its small size and unusual composition is synthesized by the familiar route involving messenger RNA, ribosomes and sRNA. (From authors introduction)

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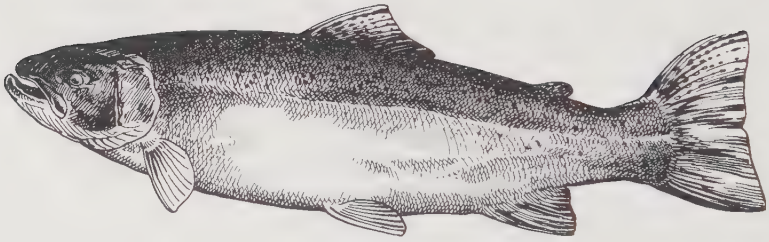

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A CENTURY OF FEDERAL FISH CONSERVATION